DEEP SUBMERSIBLE PILOTS' ASSOCIATION

NEWSLETTER

February, 1977

Vol. XI, No. 1 Published by the Deep Submersible Pilots' Assn.

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and material in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER should be addressed to:

Robert K. R. Worthington (714) 453-1158
Secretary & Editor, DSPA
3005 Curie Street
San Diego, Ca. 92122

Correspondence regarding new member applications should be addressed to the Membership Committee Chairman as follows:

Willis Forman (714) 273-2967
3940 Sioux Street
San Diego, Ca. 92117

EDITORIAL NOTES AND COMMENTS

1976 ended with four new members being welcomed on board DSPA, and 1977 commenced with five additional highly qualified applicants under consideration. The latter include our first from France. The aim of DSPA, of course, is to join all qualified persons in an association to promote fellowship and exchange of information and ideas for the furtherance of safety among those who progress down into the oceans. Thus, we welcome this growth of membership and fervently hope all our members will take advantage of every opportunity to exchange information with each other and will provide regular reports of operational and materiel matters of mutual interest to the DSPA Editor for publication to the membership.

Larry Megow was so impressed by the authenticity of the 1976 novel Raise the Titanic that he wondered if any DSPA members advised the author. He believes every submersible pilot would enjoy the book. Larry's review is included in this NEWSLETTER.

Member contributors (literary) to the NEWSLETTER are earnestly requested and greatly appreciated. To avoid extra typing demands on my busy Assistant Editor, your letters are usually included in toto. At times, they are cut and pasted in order to save a page here and there to reduce reproduction and mailing costs a trifle. We ask your secretary's forbearance as we artifically violate the rules of typing format. In this issue, we have contributions from Larry Megow, Mike MacDonald (2!), Joe (Mike?) Kishel, Jim Helle (oral), and John Donnelly. Thanks, amigos!

DSPA REPORTS AND NOTICES

Dues - 1977 membership dues are now payable in the amount of $5.00 for those with U.S.A./Canada mailing addresses, and $10.00 for overseas addresses. Those credited with having paid 1977 dues are as follows:

Cameron
Chambers
Criger
Donnelly
Forman
Hoyt
Keach
Kishel
MacDonald
Rees
Sanderson
Saner
Shiller
Worthington
Walsh

All others are requested to remit promptly to the DSPA Secretary to facilitate record keeping and maintain solvency!

Elections for 1977 officers have not been held as yet. Proposals for a slate of candidates are in order from Members. Due to the lateness of ballot action, it is proposed that the new officers will hold office through 1978 unless objections are raised.. Members are urged to advise the Board promptly of their wishes and candidates.

San Diego Luncheon Meeting at Tarantino's on 9 November 1976

Members Present

R.K.R.Worthington
W. Forman
M. Wilson
G. Shiller
J. Helle

Non-Members Present

Robert Ballard - WHOI
Chet Ballard - Consultant
D.M.Lester, CWO, USN - SEA CLIFF
G.M.Goodwin - SEA CLIFF
R.J.Norris - SEA CLIFF
T. Vetter, Lt.(jg)USN - TRIESTE II
W.Shotts, LCdr.USN - OIC, SEA CLIFF
K.Newell, LCdr.USN - OIC, TRIESTE II
Skip Marquet - WHOI/ALVIN

The visitors from WHOI described the near and long range schedules for ALVIN which include her first Pacific Ocean operations in 1977 when she will dive for several months in the Galapagos area. TRIESTE II and CYANE will participate in investigations of the Eastern Pacific Rise as part of a program to continue for several years, also. Jim Helle gave a rundown of his observations during the month-long trip to Europe from which he returned last week. Jim has obviously become the most-travelled DSPA member and probably second only to Frank Busby in his contacts with the industry. Busby, of course, is not a DSPA member.

San Diego Luncheon Meeting at Tarantino's on 18 January 1977

Members Present

R.K.R.Worthington
W.Forman
D.Saner
M.Wilson

Non-Members Present

LCdr.K.Newell - OIC, TRIESTE II
Cdr.J.Howland - SubDev Gru One
N.Estabrook - SubDevGru One, Ocean Eng.Adv.
Cdr.R.D.Waer - SubDevGru One

J.Shiller

Lt.K.W.Hanson - TRIESTE II
R.Olsen - General Oceanographics, Inc.
ETCM G.G.Ellis - TRIESTE II
ICC P.W.Filer - TRIESTE II
G.H.Fisher - General Oceanographics, Inc.
J.O'Donnell " " "
A.Smith - DEEP QUEST
P.Branson - Scripps Inst. of Ocean.

This was the largest luncheon meeting to date. Discussions were many and varied. Of course, as a result of the size of the table, it was impossible to track and record topics discussed. The Secretary read letters from Kishel, Megow, and MacDonald and passed around a beautiful photo (courtesy of Mike MacDonald) of AQUARIUS operating from "Hudson Handler" off drilling platform in the Gulf of Mexico. Merle Wilson, first assembler and user of the HANDLER, described her design and operation in answer to interested questioners. Don Saner announced successful completion of DEEP QUEST test dives reaching over 5000' and described the new life support system using superoxide to increase endurance from 45 hours to 105 hours for four men. The system completely dispenses with pressurized O_2 bottles and lithium hydroxide. Don promised a complete report for the NEWSLETTER on completion of testing.

Note: A Board luncheon meeting will be held on 22 February 1977 and a regular San Diego luncheon meeting on 1 March 1977.

New Members welcomed into the DSPA since the last NEWSLETTER are as follows:

Frank Chambers of Environment Canada (PISCES IV)
Ian Sanderson " " "
LCdr. Bob Rees of SubDevGru 1 (ex- DSV TURTLE)
Carroll Hoyt (Associate Member), General Manager of General Oceanographics, Inc., (NEKTON α, β, γ)

Congratulations to these gentlemen are in order. The DSPA is honored to have them in our association.

Oceans '77, the annual international conference of the Marine Technology Society and the Institute of Electrical and Electronics Engineers will be held in Los Angeles, Ca., 16-19 October 1977. The DSPA Annual Meeting will be planned to coincide with that occasion.

Offshore Technology Conference, to be held at Houston, Texas, 2-5 May 1977, will be by-passed as far as DSPA is concerned inasmuch as it has been impossible to assemble a sufficient group of members at past OTC's.

Oceaneering International will hold two-hour demonstrations of their new 3000' bell with the G.E. force feedback manipulator on 8-9 March 1977 at the Shell Test Facility, 5521 Gasmer Road, Houston, Tex. Anyone interested may contact H. Klepfer, Oceaneering International, Inc., P.O.Box 19464, Houston, Texas, 77024 (tel: (713) 461-4477).

REPORTS FROM MEMBERS

Jim Helle (Helle Engineering) on his 4 November return from a month-long business trip to Europe, had much of interest to recount. His report included the following:

(1) COMEX experienced a submarine casualty about July 1976 which has resulted, at least for the time being, in their laying up their submersible fleet and laying off the associated personnel. One of their boats was launched with four men on board. On this particular boat, the hatch dogging wheel rotates in the opposite direction from those on the other COMEX boats, and the crew member who shut the hatch turned the wheel in the wrong direction. As the boat submerged, water entered, the hatch was flung open, and one man escaped on the surface. Two more exited as the boat passed perhaps twenty feet. Of these two, one survived with a fractured shoulder and other, a customer's (Shell?) engineer, drowned. The fourth man shut the hatch and survived in the half flooded boat when it hit bottom at about 140'. The support vessel effected a very expeditious retrieval of the boat and survivor so that the casualty list was limited to one engineer. The lessons regarding training, checks, standardization of equipment and procedures, etc., are obvious. Like most tragedies, this one never should have happened.

(2) Vickers boats were still diving in October despite the onset of bad weather. Having passed the 10,000 launch mark, they have become very adept and operate in State 6 seas.

(3) Competition among the submersible operating companies is very keen. As a result, it's very difficult to get information from them or to interest their pilots in joining DSPA.

John Donnelly - WHOI - ALVIN - 10/29/76

"ALVIN is presently in 'annual overhaul' which started in early September. We expect to have ALVIN back in the water about 19 November for trials here in Woods Hole and loading aboard ship. Departure for the Bahamas is set for 29 November. We expect to make test dives there, certify the submarine, and then do some working dives prior to Christmas vacation. All of this is in preparation for going into the Pacific for a series of dives off the Galapagos Islands in February-March.

"If all goes as well as we hope, ALVIN will return to Woods Hole about mid-June to take up the summer program of science in New England waters.

"By the time this is published some of the above schedule will be history--we hope we are realistic with our dates.

"Sorry I was in arrears. I figure I never got the NEWSLETTER reminding me of dues. Mail was very unsat on our cruises this past year.

/s/ Jack Donnelly

Hyco Subsea Ltd.

P.O. Box 1059, Station "A"
Vancouver, B.C., Canada V6C 2P1
Telex 04 55465 — Cable: "Thinkdeep"
Telephone (604) 681-0342 / 688-8607

Submarine pipeline & cable surveys & burial / wellhead inspection & intervention / deep salvage & arctic systems

Editor, DSPA Newsletter
3005 Curie Street
San Diego, California 92122

December 6, 1976

Dear Bob,

I am sitting at an airport fogged in so I thought it about time I brought everyone up to date on Hyco Subsea's activities in the Gulf of Mexico. I have spent most of the time since O.T.C. in the Gulf drumming up business or out on the odd job.

The support vessel, the Hudson Handler, steamed (in May of this year) from Halifax to Morgan City where it was met by the Aquarius which has been on display at the Offshore Technology Conference. The first task was to trial our new O.R.E. TransNav Acoustic Positioning System. Even the old dead reckoning die-hards were impressed. Aside from the specific applications of a precise plotting system and the increased safety, it sure does increase the efficiency of any submersible operation.

In July we were at sea in the Eugene Island area doing a demonstration for Shell Oil Company. This involved plotting the location of flow lines that had been laid to the Lockheed manifold center. This was done using the O.R.E. Transponder System. The flow lines were found to be buried, so the pilots had to "feel" their way along with the manipulator. Incidentally, more traditional surface oriented methods had resulted in plotting errors as much as 300 feet.

During a dive to inspect a wellhead cellar, the Aquarius became "stuck." Poor visibility on her initial approach to the wellhead (using sonar) resulted in her being caught underneath the flow lines. After three hours of analysing exactly how she was positioned and using information obtained from the surface, Aquarius, piloted by Bob Holland, [redacted] was able to free herself. Aquarius came free just a few mintues before the deadline we had set to mobilize the divers. A crew from Martec, working in the area, had responded with an offer to help when contacted earlier, and had been standing by. The primary lesson, relearned, "when possible, know more about the ojbect you are planning to operate around."

In September, we had our first contract with Columbia Gulf Transmission Company. The task was to precisely locate coral outcrops known to be in an area where a pipeline would have to be laid. The O.R.E. System was calibrated in terms of the local Louisiana Lambert Grid System allowing the geodetic coordinates of coral to be printed out by the acoustic system in real time.

Aquarius was at work in October through November again for Columbia Gulf. This task was to inspect and video tape a new pipeline. During this work, the support vessel and crew demonstrated their ability to work in weather conditions that had most operations shut down (winds 25 to 30 knots, seas 8 feet).

The most recent work has just been completed (November 20). This came about when a gas pipeline was ruptured. Aquarius was in the water about 17 hours after the first call. After considerable difficulty in finding the line and after divers had unburied it, video recordings were made of the damaged area. Although I should not have been surprised, the customer commented that better video was taken by the submersible than by divers who also inspected it.

I would like to invite anyone in the Houston area to join me for lunch anytime they are in town. I can "normally" be reached at the office, (713) 688-6382, or the company apartment at (713) 686-0476. I hope my next report will not be so long in coming.

January 27, 1977

Mr. K.R. Worthington
Editor, DSPA Newsletter
3005 Curie Street
San Diego, California 92122

Dear Bob,

Here is a short report for the next newsletter.

Aquarius, the M.V. Hudson Handler and their crews have just completed their most successful job to date, and set some records for submersibles working in the Gulf of Mexico in the winter. Aquarius inspected 47 miles of pipeline during a total of 19 dives in 10 working days. The call from J. Ray McDermott came on December 27th, and sub and ship crews were mobilized from Vancouver and Canada's east coast respectively. On January 21st, they returned to port, job complete.

Considerable delays were caused by weather, and 60 knot winds had to be contended with during the period at sea (17 days). Launching and recovery went on in Sea State 6. This job certainly will go a long way to making submersibles and the people who run them accepted in the Gulf oil patch.

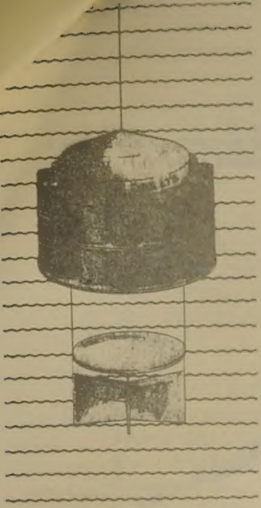
Another announcement is also required at this time. With considerable regret, I have decided to leave Hyco. This will be effective in February. After nearly 10 years, it was a difficult decision , however I felt the time had come for a change. I intend to stay in the subsea business and maybe have a closer look at tethered vehicles.

Sincerely,

M.D. Macdonald
Technical Manager

MDM/kao

HYCO SUBSEA LTD.
c/o Hyco International Engineering, Inc.
4800 West 34th St., Suite C-7
Houston, Texas 77092
Phone (713) 688 - 6382



DEEP DIVING SYSTEMS LTD.
POST OFFICE BOX 717
THUNDER BAY P. ONTARIO. CANADA
TELEPHONE ~~[illegible]~~ 344-7621

December 14, 1976.

First, could we get my name straight - it's not Michael J. Kishel, but Joseph M. Kishel. I am honored to have been accepted as a member of D.S.P.A.

I left Harbor Branch Foundation in June and moved up here to Thunder Bay, Ontario. I am presently working for Deep Diving Systems Ltd. building the "DDS Constructor" with my associate John Girard, formerly of Innerspace Services Corp., Gretna, Louisiana.

The "DDS Constructor" will be a 2 man, A.B.S. Certified, attended submersible with a 1,650 ft. depth rating. The submersible has 2 modes of operation - the 1 atm. observation mode and the lock-out mode. The submersible is tethered by a 1,800 ft. long, custom made, moulded umbilical which provides - 440 VAC., 45 KW. power, air, mix-gas and oxygen supplies, hot water for heating the atmosphere and divers suits, and hard-wire communications. The television and 35 mm. still cameras on a pan and tilt mechanism are controlled from the surface. Internal and external temperature and depth, and vehicle heading are also monitored on the surface.

Operated from within the submersible are: 2 joy-stick controlled, 5 H.P., 440 VAC. thrusters with variable pitch reversible propellers and a 180° tilt mechanism, 2 joy-stick controlled hydraulic manipulators - a 7 function fully articulated arm and a 5 function heavy lift arm, a jet-pump and nozzle directed by the articulated arm, and 1,800 lb. capacity pressure-compensated variable ballast system, sonar, pinger receiver and digital heading read-out. The internal electrical system is helium purged and pressure compensated. Pressure sensitive electronics are removed for the lock-out mode. Emergency systems include on-board mix-gas, oxygen and 24 VDC. supplies, closed-circuit emergency breathing system, underwater telephone, droppable "landing-pod", and umbilical guilotine. The hull is covered with syntactic foam for insulation and buoyancy.

Completion will be in 1977. Enclosed is an artist's conception of the completed submersible.

Seasons Greetings,

DEEP DIVING SYSTEMS LTD.

J. M. Kishel,
Chief Submersible Pilot.

JK:pr
Encl.

DEEP DIVING SYSTEMS LTD.

POST OFFICE BOX 717
THUNDER BAY P. ONTARIO. CANADA
TELEPHONE [redacted] 344-7621

DDS CONSTRUCTOR

Book Review On

RAISE THE TITANIC

by

Larry Megow

The (314) page, hair raising thriller "Raise The Titanic" written by Clive Cussler, published in 1976 by the Viking Press, is perhaps the most superlative, high adventure novel I have read.

This excitement packed narrative weaves murder, clever espionage, chills, sabotage, intrigue, a mine disaster, danger, politics, Russians, sonic booms, Communists, payoffs, the F.B.I., the C.I.A., the K.G.B., the President, atomic missiles, heroes, pensions, spies and hurricanes, in with a little spicy sex and a few four letter words.

But, the book's most titilating interest-raiser, especially for deep submersible pilots, divers, salvage crews, engineers, oceanographers or any one else connected with the high seas, is that the author has apparently based this amazing, exceptionally well written mystery on recent, actual scientific sea events . . . some of which ended in disasters.

The deep submersible Sappho I, a 24,000' boat with an "overgrown weiner shaped titanium hull, which in the novel rides a deep ocean current for two months without surfacing, is undoubtedly based on the thirty (30) day 1969, 1,500 mile drift of the six (6) man, 2,000' Ben Franklin built by Grummen Aircraft.

Modoc in the novel "The finest deep water salvage vessel the Navy's got" is patterned after the Navy's salvage ship, Mizar, which, way back in 1969 salvaged the deep submersible, Alvin, from 5,200' in the North Sea where Alvin had lain submerged for almost a year.

The novel's Sicilian Project is a National Defense program employing a rare element, Byzanium, a thousand times more potent than plutonium. The novel draws on the published intrigue of the real life "Project Jennifer", purportedly funded by the C.I.A. for $350 million, and spent by Howard Hughes.

The real life Project Jennifer raised the 320' Golf II Class, Russian Submarine equipped with hydrogen bomb tipped missiles . . . from 16,000 feet beneath the Pacific.

In fact, in two paragraphs of "Raise The Titanic" the author refers directly to the 1974 to 1976 C.I.A.'s Russian sub raising Project Jennifer.

The novel's *Sea Slug* fits to a "T" the 15,000' boat Aluminaut; Sappho II is not too unlike Alvin with its new 12,000' titanium hull; and "Deep Fathom" which gets tangled in debris on the deck of the Titanic at 12,000', is patterned after the July, 1973 Johnson-Link tragedy, in which two divers died from carbon dioxide poisoning when their small sub became entangled for 31 hours with a shipwreck at 360feet, 20 miles off Key West, Florida.

To make this hair raiser even more intriguing the author uses phases of the Watergate coverup to keep Congress from finding out about the several billion dollars spent in raising the Titanic.

However, in the end after the 882' Titanic was successfully raised and the spoonful of highly prized byzanium was not found aboard, unlike Watergate, the fictional President of the United States decides not to cover up.

The author does make one little error. The 45,000 ton luxury liner, Titanic, which actually did sink in April 15, 1912 with a loss of over 1,100 lives, was not salvaged until 1988. In the novel, while the structural engineers and marine scientists are trying to figure out how strong the Titanic's hull is, author Cussler says, " . . . They frantically shoved their slide rules back and forth." Even now - 1976 - the mini Computer Age, slide rules are an engineering tool of the past.

Reading *Raising The Titanic* is a breathtaking, suspenseful experience!

Larry L. Booda

Ocean Engineering's Small Step Forward

On this page in September, 1975, we noted that the fourth annual report of the National Advisory Committee on Oceans and Atmosphere recommended formation of an Institute for Engineering Research in the Oceans (IERO). We warned that taking such a step that would require additional funding in a constricting budget climate would be unrealistic. Instead, we suggested one small first step, the formation of a planning staff in the National Oceanic and Atmospheric Administration (NOAA) to prepare for coordination of the many ocean engineering activities within the federal government, and to some extent, industry and research institutions.

Now we are happy to report that NOAA has taken that first step with creation of an Office of Ocean Engineering (OE). But instead of having that office buried one or two levels down in the organization (we had suggested placing it under the National Ocean Survey), it is reporting directly to the administrator of NOAA. That should give it some clout, as long as the administrator backs it with interagency representation that will truly permit it to coordinate the activities of the Navy's many laboratories, the Army's two laboratories, NOAA's other ocean-oriented activities, the Coast Guard and the Environmental Protection Agency plus other odds and ends of ocean engineering in the executive branch. But such coordination will become successful only if the heavyweight in that field, the Navy, is brought positively into the fold. NOAA since its inception, and its predecessor ESSA, have been noticeably cool to the Navy, and that is a minus for the taxpayers.

Acting Director Steven N. Anastasion, an old hand at ocean engineering, has gathered these components together using already appropriated funds:

- NOAA Data Buoy Office at Bay St. Louis, Miss. James Winchester remains its director.
- Manned Undersea Science and Technology Office under Dr. Donald Beaumariage. MUS&T is embarked on the ambitious *Oceanlab* undersea habitat project. (See page 9).
- Ocean Instrumentation Engineering Office, with Anastasion as acting director. This is the tattered remainder of what was the National Oceanographic Instrumentation Center (NOIC). NOIC has been dismembered, as was recommended two years ago by the Marine Board of the National Academy of Engineering. NOIC's San Diego (Cal.) Regional Center has been closed. The center at Seattle, Wash., has been assigned to NOAA's Pacific Marine Center, while the center at Bay St. Louis, Miss., has been taken over by the Navy. Where this leaves industry and research institutions in the matter of instrumentation standards isn't clear. Anastasion states that OE plans to work with the National Bureau of Standards on this problem. NOIC's former director Gilbert Jaffe is off on a two year intergovernmental exchange program with the Florida State University Institute of Oceanography (SUSIO), where he will concentrate on ocean engineering coordination problems in Florida and other states of the region.

Working directly for Anastasion in Advanced Planning and Special Projects is Joseph R. Vadus, former Navy marine engineer who worked on the small nuclear powered submarine NR-1.

Although OE reports directly to the administrator, its guidance will come from NOAA Associate Administrator for Marine Resources David H. Wallace. Deputy Director of OE is Capt. William Barbee, NOAA Corps, while the plans and programs office is directed by Donald Critchfield.

OE will feel its way initially, according to Anastasion, but the broad aims are to prepare for the future. Among the concerns are the setting of environmental standards for offshore oil and gas exploitation, Ocean Thermal Energy Conversion (OTEC), polar programs and others. This will require close data exchange and cooperation with the Environmental Protection Agency and the Energy Research and Development Administration. One major project is the planning for the ocean engineering program for the Fiscal Years 1978 and 1979 to crank it into the budget cycle.

OE has its task only partly defined. It is embarked on a pioneering effort. We are glad to see a former Navy officer heading the office, for closer ties between NOAA and that service are demanded. In a sense it can write its own ticket, following modestly some of the recommendations for an IERO for the near future, but striving for the greater goal two or three years from now. There is a selling job to be done within the administration and in Congress before great strides toward an IERO can be taken.

Sea Technology applauds the stated aim of operating OE not only for the benefit of the federal agencies and research institutions but also for the private sector. Industry is not in a position to create its own standards or perform basic engineering development. Inclusion of private enterprise can result in economic gain for the United States.

Underwater Laboratory System Contract Awarded G.E.

Study of preliminary design, cost and schedule for an underwater laboratory system will be carried out by the Re-entry and Environmental Systems Division of General Electric Company in Philadelphia under a $67,950 fixed price contract awarded by the National Oceanic and Atmospheric Administration of the Department of Commerce.

The study will be based on preliminary system performance requirements established by NOAA for the OCEANLAB concept. OCEANLAB was conceived because the [illegible] shore oil and gas, minerals, and fish stocks [illegible] require advanced U.S. capability [illegible] research and exploration capability that does not now exist.

The OCEANLAB system will include a capability for autonomous, self-propelled operations at a maximum depth of 1640 feet (500 meters). It will also include a capability for being in place for up to 30 days at a single site on the bottom, and to accommodate up to 10 people.

The G.E. study will include description and configuration, size, weight, and performance characteristics of possible vehicles, as well as a description of major functional elements such as laboratory and work space, life support, propulsion, navigation, power, and communications.

, November 18, 1976

Divers Seek $294 Million WWII Booty

A small group of Americans is seeking permission from the People's Republic of China to dive for a sunken cargo with a possible recovery value of $249.4 million, it was learned yesterday.

The cargo, believed to contain $134 million in gold alone, is in the hold of a Japanese freighter sunk during World War II.

Mrs. Wanda Vail of San Diego, owner of the Vail-Smith Co., public affairs specialists, identified her company as the "official publicists for this venture."

Vail said the salvage team includes former astronaut and Sealab aquanaut Scott Carpenter and Jon Lindbergh, the son of pioneer aviator Charles Lindbergh. Also in the team is Bill Bunton, a San Diegan and a former Sealab diver.

The treasure is believed to be inside the freighter Awa Maru, which was sunk by the U.S. submarine Queenfish on April 1, 1945.

The Awa Maru was ostensibly a hospital ship, bringing Red Cross supplies to Allied prisoner-of-war camps in Malaya and returning wounded Japanese soldiers to Japan.

It was believed the ship was loaded with a cargo of valuable metals, money and artifacts plundered from occupied Pacific territories by the Japanese army.

Reached at her home last night, Vail was asked to comment on published accounts that the cargo was believed to contain $5 billion in treasure.

"The $5 billion figure is pure speculation. It is somebody's dream and can't be verified," she said.

Vail said she obtained her information on the venture from Bunton.

VALUABLE CARGO

Asked the location of the ship, Vail said, "It is off the coast of China, that is all I can tell you."

Vail said the "documented cargo is said to contain gold, platinum, industrial diamonds, tin and tungsten wire.

She said the negotiations on the venture with China are confidential as are the salvage operations.

The permit application to Peking is being sought under the name of Salvage and Diving, an international corporation headed by Bunton.

))) **Law of the Sea: Sick But Not Moribund.** It could [illegible] thoracic and cranial cavities of a U.N. body [illegible] of Law of the Sea Conferences ended in New York Sept. 17, still far from reaching agreement on the major issues. The stickiest point concerned deep [illegible]. The developing nations, called the group of 77, but actually more than 100, want a United Nations Authority to have complete control of mining [illegible] evenly. Developed nations would furnish the technology [illegible] finance the U.N. Enterprise if the mining rights were [illegible]. There was still lack of agreement on just how much jurisdiction coastal nations should have over a 200 nautical mile zone, with ideas ranging all the way from economic rights of the resources to full sovereignty, making it a territorial sea. Delegates who talked to **Sea Technology** called the last weeks a disaster. In any case, another conference is set for next May 23 for seven, and possibly eight, weeks. In the meantime Canada's 200 mile zone becomes effective Jan. 1, 1977, and the U.S. zone March 1, 1977.

Frenchmen Chart Rich Nodules

By CLIFF SMITH
Science Writer, The San Diego Union

One of the mysteries gnawing at marine mining geologists is why manganese nodules — the new "black gold" treasure of the sea being sought by more than a dozen nations — are found abundantly in some places on the ocean floor but not others.

Could it be that the occurrence of nodules is somehow related to the character of the sediments beneath the sea floor, even though all the nodules lie on the floor surface?

This is the question that French earth scientists who have been working off San Diego are asking

After a month at sea, midway between Hawaii and the tip of Baja California, the group arrived recently at B Street Pier aboard the research ship Le' Noroit for a brief respite before going back to work.

"I can tell you this — you certainly have the world's richest deposit of nodules lying directly west of San Diego, between here and Hawaii," said Dr. Raymond Lesuave of the Centre National pour L' Exploitation des Oceans in Brest.

"In some places between here and Hawaii, the density of the nodules is as high as 20 kilograms (44 pounds) per square meter of ocean floor.

"More important, the percentage of nickel and copper in your nodules is high, well above the economic break-even point for mining."

So why haven't the nodules been mined? It has been common knowledge for more than two years that at least three international mining consortiums have had the technology ready to scoop out the nodules.

"I am afraid that is a question difficult to answer," replied Lesuave, the chief scientist on Le' Noroit. "It is a matter of speculation. Many people say that the mining companies are awaiting sanctions that can only come out of the troubled law of the sea talks. I think that may be true."

Meanwhile, Le' Noroit and another French research ship have been exploring the great nodule belt between the mainland and Hawaii since early last year. And, before that, they concentrated on the South Pacific ocean floor, disappointingly.

"There, the nodules are not so abundant and not nearly so rich in the minerals needed most — copper, nickel, cobalt and molybdenum.

"Our interest here is not so much in this deposit but finding the clues that may tell us how to find other mineable deposits in oceans everywhere.

"So we are trying to correlate faulting, hills and dales in the ocean surface and the nature of subsurface sedimentology with the occurrences of nodules. If a correlation is found, it may be helpful in locating new deposits."

Lesuave said he and his colleagues and their counterparts at Scripps Institution of Oceanography have been actively trading scientific information about the nodules. In fact, one scientist now joining the ship, Dr. Laurent D'ouzouville, flew from France to San Diego a week ago for conferences with Scripps' Dr. Jimmy Greenslate who coordinates all U.S. nodule research efforts.

The 160 -foot ship was met by Jean Pierre Paris, the French consul in San Diego. The ship will be in and out of San Diego through next June, when it will return to France, via Tahiti.

LMSC, two other firms plan joint ocean mining venture

LMSC and two other major companies announced they have reached a general agreement to work out terms for a joint venture in the research and development of deep sea mining — a field Lockheed has been intensively exploring for the past 13 years.

The two other companies are Billiton International Metals B.V. of The Netherlands (a Royal Dutch Shell company) and Amoco Minerals Company of Chicago (a subsidiary of Standard Oil of Indiana

It is expected that LMSC, which has already designed and built a 1000-ton a day test miner, will act as operator of the joint venture

Objective of the joint venture is to further develop existing and new technology to mine and process manganese modules, known to be present over vast areas of the largely untapped ocean floors. Apart from manganese and iron, the nodules contain some nickel, copper, and cobalt

In connection with the ferromanganese nodules — they average about two inches in diameter but sometimes are larger than baseballs — LMSC has developed a hydrometallurgical process that extracts and recovers the nickel, copper, and cobalt. Most of the Lockheed research on the program was at LMSC's Palo Alto laboratories over a period of years. The process was also successfully tested in a mini-pilot plant

LMSC built its advanced design miner after extensive testing of subscale components. The miner has been in development tests for more than a year in a simulated sea floor as well as submerged in a larger water filled tank

Contract R/Vs Would Save U.S. Money

by Charles W. Gattas
Vice President, Tracor Marine

It seemed evident from his message to the oceanic professional and business leadership convened at Oceans '76 last September that Campaigner Jimmy Carter had more interest in, and knowledge about, the ocean environment and its problems than any president since ex-Navy man John F. Kennedy. His call for an integrated, coordinated, cohesive and (most important of all) coherent national ocean policy was right on target.

The need for sound organization and management with regard to ocean matters is clear. As the Bicentennial year ended, it was difficult to name even one major non-military Federal ocean program that had produced specific and beneficial results for the American people, or which had even generated any sense of national unity and purpose as the space program did.

We are way behind in our fisheries. Our merchant marine is largely antiquated and non-competitive. We have been unable or unwilling to establish a self-interested national policy on open-ocean and seabed resources, even though industry stands ready to invest in developments that could reduce American dependency on unstable foreign sources of critical minerals.

We have environmental legislation so ham-handed that mandatory penalties are imposed for accidental oil spills that are self-reported and are promptly and efficiently cleaned up by the offender, thus fostering the same disrespect for law that permeated the country during Prohibition.

The situation President-elect Carter faces is certainly challenging. But I think that we in the ocean community had better accept that a national ocean policy, like any other national policy that intrudes on staked-out bureaucratic, political, social and economic boundaries, will come neither easily nor soon.

Our best hope for early constructive action lies in those areas that are within the enclave of Executive powers, even though the actions taken may have to treat more symptoms than causes at first. Some specific recommendations I'd make are:

- Get the Government out of the business of operating research ships. The Federally owned and funded research fleet is composed of ill-designed, all-things-to-all-men, white elephants that are so inefficiently used and expensive to buy and operate that they impose an intolerable drain on the monies that should be spent on science and technology. This also applies to research aircraft.

- Impose the same kind of cost-benefit analytical and go/no-go decision-making and justification requirements on ocean programs that are imposed in military programs. The military isn't perfect, but it generally spends money far more wisely than the less-disciplined scientific community.

- Restore the universities to their traditional roles of education, creative thinking, basic research and experimentation. Developmental and operational programs are far too important to be left to academicians who have no concept of schedule and cost responsibility, and a pronounced tendency to veer from specific program objectives. In spite of this, the Government subsidizes university ships, which in turn are used to compete against private industry.

- Drag the Coast Guard's shipbuilding, admeasurement, and manning regulations into the twentieth century. Research ships especially need an enlightened set of rules to match the unique character of the work they do. ▶

NEWEST SUBMERSIBLE. The newest Tethered Remotely Operated Vehicle, *TROV S2*, is under construction at the McElhanney Offshore Surveying and Engineering plant in Port Moody, B.C., Canada. The unit will be operated by Sonarmarine Ltd., a British Petroleum subsidiary. The *TROV S2* is the third submersible of its type to be built by McElhanney. The vehicle is 7 ft long; 4 ft, 2 in. high and 4 ft, 2 in. wide. It has a diving depth of 1,200 ft and is equipped with 1,500 ft of umbilical cord. The unit has two manipulators and is maneuvered by four 5-hp motors with controllable pitch propellers.

600' Lockout Dive Off Fla. Made By Harbor Branch Diver

A diver from Harbor Branch Foundation, Inc., recently locked out from a submersible for a dive to 600 ft. on the continental shelf off the east coast of Florida. It was carried out without incident and the 15-minute dive required 18 hours of decompression time.

Chris Tietze, co-manager of the R&D Department of Harbor Branch, was the diver. During the dive he was in continuous communication with Marshall Flake, submersible technician, who was in the diver compartment of the attending submersible, *Johnson-Sea-Link II*. A second submersible, *Johnson-Sea-Link I*, remained on station at the dive site while the dive was in progress to serve as an observation/standby submersible. Harbor Branch Foundation, Inc., is a not-for-profit corporation in Fort Pierce, Fla., engaged in marine science and engineering research

Galapagos Rift Study Set

Metal-Bearing Springs To Be Probed

FEB 77

By CLIFF SMITH

[illegible]

Boiling, metal-bearing springs at the bottom of the Pacific [illegible] an ambitious expedition starting this week from St. Croix, Virgin Islands.

Scientists [illegible] investigate a great cleft in the sea floor north of the Galapagos Islands where superheated water and lava boil up out of the earth's interior.

Extending their sensors and sampling devices into the seething fumaroles, the researchers will be keen to avoid driving their fragile craft into the flux from nature's boiler rooms. The temperature of water where it spews up into the ocean may be as high as 400 degrees Fahrenheit.

The fumaroles, which in this case lie along a center of sea floor spreading called the Galapagos Rift, are of scientific interest for many reasons. But, two particular possibilities fire the imagination.

One possibility is that man eventually may be able to harness the geothermal energy of the marine hot springs, much as he does on land, to save fossil fuels for where they [illegible]

The [illegible] to the [illegible] including [illegible] depleting [illegible]

$1 Million Project

The $1 [illegible] by the National Science Fo[illegible]ves many institutions, including Stanford University, Oregon State University, Massachusetts Institute of Technology, [illegible] Hole O[illegible] Institution and the U.S. Geo[illegible] Scripps Institution of Oceanography, [illegible] conspicuously is absent from the list of instituti[illegible] directly involved.

Yet with[illegible] Scripps steals the show in a sense. That is [illegible] scientists taking part in the cruise received their education or training at the La Jolla [illegible]

Woods [illegible] 245-foot research ship Knorr [illegible] other [illegible] the three-man, 22-foot research submersible [illegible] and its tender Lulu.

Some scientists and technicians already are aboard ship. Others will board at Balboa, Canal Zone, on or about Feb. 10. The fir[illegible] dive is planned about Feb. 15. Diving will continue until late in March.

The Galapagos Rift is an east-west trending branch of the so-called East Pacific Rise, another cleft roughly paralleling the west coast of Central America where viscous rock is being squeezed up out of the earth's mantle to form two distinct plates of earth crust.

Two former Scripps scientists with key roles in the expedition explained its significance in telephone interviews.

"For the last six or seven years we have suspected that there were hot springs on the ocean floor along midocean rifts that bring hot water from rather deep in the earth, perhaps two miles down," said Dr. Tjeerd H. van Andel of Stanford, a research geologist at Scripps for several years.

Last summer, he explained, a preliminary investigation of the Galapagos study area, about 500 miles west of Ecuador, established the existence of the fumaroles beyond any doubt.

Dissolved Chemicals

[illegible] highly charged with dissolved chemicals, including some commercially interesting ones like copper, nickel, cobalt and zinc," Van Andel continued.

"When water from the hot springs comes in contact with the cold ocean water — which is barely above freezing — the chemical conditions change sufficiently that the copper, nickel and so on precipitate out together with an awful lot of iron and manganese and form deposits on the ocean floor.

"These deposits have been known for a long time and they are a potential resource for things like copper and nickel, although at the moment the technology is such that it would be too expensive to exploit them. But that's not going to be the case forever as resources on land are exhausted.

"So the reason we want to go to the bottom of the ocean is, first of all, to locate and observe these hot springs very precisely and, secondly, to measure in an individual hot spring, hopefully several, the flow of water, the chemistry of the water, its temperature and the chemical processes that take place when it mixes with the cold ocean water.

"In this process we hope to better understand how these deposits form — an important question for determining [illegible] located where they are and how we can eventually utilize them."

Dr. John B. Corliss, an OSU geochemist and a former Scripps student, is the project coordinator.

"[illegible] interesting thing [illegible] if you want," Corliss said.

Major Process

[illegible] energy [illegible] comes [illegible] through newly [illegible]

[illegible] springs are by themselves [illegible] are a very large number of them. [illegible] suggested that these springs at the bottom of the ocean [illegible] geothermal reservoirs in that we coul[illegible] energy."

Conceivably, [illegible] be devised, the submarine fumaroles could [illegible] such as geysers onshore are exploited: The [illegible] and pressure of the fumaroles could be used to dr[illegible] directly or indirectly, turbines connected to electrical generators.

[illegible] and students taking part [illegible] Dr. Richard von Herzen of Woods Hole [illegible] of OSU, Drs. John Edmond and [illegible] and Dr. Louis Cordon of OSU.

[illegible] principals are Dr. Robert Ballard of Woods Hole and Dr. David Williams of the USGS.

The C.S.S. PANDORA II is the mother ship for the PISCES IV. She was christened on 2-16-74 and was built by HYCO.

PANDORA II is a vessel of 1,200 gross tons and is 191 feet overall with a top speed of 14 knots and a cruising range of 40 days at sea at 12 knots. She carries 7 officers and a crew of 12 with a total accommodation for 36.

She is equipped with a heavy lift hoist on the stern for handling the submersible. She is also ice strengthened and is capable of operating worldwide.

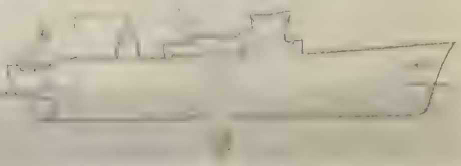
C.S.S. PANDORA II – special purpose hydrographic survey vessel

Diving support ship handles both diving bell, submersible

The diving/submersible support ship *Star Pisces* has finished sea trials after a £3 million conversion from a factory stern trawler at **Boele's Shipyard**, Rotterdam, early in October. The ship was chartered by **Hamilton Brothers** for long-term use on the UK North Sea Argyll field for subsea wellhead maintenance and inspection.

The ship was formerly known as the *Gadus*—Latin for God—and was built by Aker for Norwegian owner Lief Havge in 1967. The new owner, British firm **Star Offshore Services**, bought her in February this year, after which she was handed over to Boele's.

The *Gadus* was chosen for conversion because she had a high freeboard, good seakeeping ability, more than adequate accommodation, large deck area, and ample electrical power and propulsion. The ship's dimensions are: over-all length, 263 ft; molded breadth, 44 ft; molded depth, 27 ft, and molded draft, 17 ft. Her gross tonnage is 1,530 tons.



Diving/submersible support ship *Star Pisces* was converted from a factory stern trawler

The *Star Pisces* is being sub-contracted to Hamilton by Strongwork Diving (International), which is contracting the ship from Star Offshore. Strongwork's divers are to maintain the subsea wellheads, flowlines, SPM and all associated pipe lines, as well as undertaking light construction work as needed. Strongwork has chartered P&O Subsea Ltd.'s submarine *Mermaid III*, which will be carried on board *Star Pisces*. It will be used in an inspection and troubleshooting role when the surface vessel cannot be stationed directly over the area.

For deep diving, a moonpool has been installed up to the main deck of *Star Pisces*. Its special shape, evolved from tank testing, is said to give the least possible reduction in steaming speed and the best possible dynamic effect for bell recovery. It is aerated by a large compressor further to reduce bell recovery problems in high seas.

The original trawl ramp has been retained for maintenance work. A platform above the ramp allows the submersible to be operated. In addition, a hose can be recovered up the ramp by lifting the platform. For hose maintenance, a hatch has been fitted through to the 'tween deck area, which is now a workshop.

Strongwork Diving's 1,000-ft capability saturation diving system is located in the 'tween deck area. It consists of two decompression chambers and a transfer chamber.

There are two positioning methods for *Star Pisces*. First, a four-point mooring system which enables the vessel to lay her own anchor pattern in up to 300 ft of water, with assistance in up to 600 ft.

Secondly, a Honeywell ASK system will use the two transverse thrusters plus the main screw—all of which have controllable pitch—to maintain station in up to 1,000 ft of water.

Japan's First SDC Developed By NKK

Japan's first submersible decompression chamber (SDC) has been developed and marketed by Nippon Kokan (NKK), a Japanese steelmaker and shipbuilding firm.

According to NKK spokesmen, the SDC can be used for research and exploration of continental shelves, offshore construction work, salvage, as an underwater laboratory for testing oceanographic equipment, and as a base for diver training.

It is a combined personnel transfer capsule (PTC) and decompression chamber. Therefore, it can serve as either a long-term base for divers engaged in deepsea activities, or as a vehicle for transporting divers to and from the bottom in a pressure-controlled environment.

The SDC is constructed of 19 mm (¾″) thick steel plates with a 2,140 mm (7.01 ft.) inside diameter and a 3,090 mm (10.2 ft.) overall height. Including the anchor, total weight is 8.5 tons. It can accommodate one tender and three divers for a maximum of eight hours.

The mother ship supplies electrical power for life support and either compressed air or a helium/oxygen breathing mixture. For comfort the SDC has a built-in electric heating system. For emergencies, it has its own gas mixture. Steel cables suspend it from the mother ship.

Although normally the surface ship would control such things as compression and decompression, surfacing and wire and wireless communications, the SDC is equipped with emergency apparatus enabling divers to control these things.

One of the NKK-built units has been in use since late 1975 by Japan's Fukada Salvage Company, and the company has found it useful to depths as great as 80 meters.

DEEP QUEST FACES NEW MISSION—LMSC people at the Lockheed Ocean Laboratory in San Diego prepare the Deep Quest research submersible for a return to the sea on a new Navy test.

DSRV power source

Deep Quest to sea-test new fuel cell for Navy rescue sub

LMSC's research submarine Deep Quest will be the first ocean-test platform for the U.S. Navy's newly developed fuel-cell system designed to power rescue submersibles.

Lockheed is under contract to the Naval Sea Systems Command to demonstrate the feasibility of the fuel-cell system later this year as the primary source of electrical and propulsion power for a submersible. Further tests on a Navy Deep Submergence Rescue Vehicle (DSRV) are anticipated later.

Originally, one of the Navy's two DSRVs was planned to be the first test platform. With the change, both will be free to continue their active schedules and remain available for fleet submarine-rescue missions.

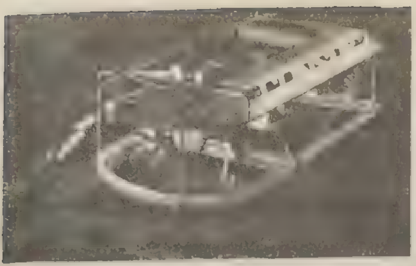
Jim Wenzel, vice president for Ocean Systems, said the 50-ton Deep Quest has been refurbished at company expense at the Lockheed Ocean Laboratory home base in San Diego. In December it made several test dives, going as deep as 5000 feet.

The 40-foot submersible Deep Quest will be modified and the 30-kilowatt fuel-cell powerplant installed together with reactant tanks and controls, ready for tests this summer. Eventually, two 30-kw power plants will be installed on the DSRV.

Highly efficient, the fuel-cell powerplant makes electricity electro-chemically without normal combustion by consuming gaseous hydrogen and oxygen. The byproduct is water. The system is completely self-contained and requires no outside power source to start or to operate.

The fuel-cell powerplants were made by United Technologies Power Systems Division, East Hartford, Conn., under separate government contract. The powerplants can produce 700 kilowatt-hours of electricity before refueling, seven times the amount that the DSRV batteries can supply without recharging.

Dr. William B. McLean, *former tec[illegible]cal director of the Naval Undersea Center (NUC), [illegible]n Diego, died August 25. In his honor the NUC Administration/Laboratory Building has been re-named the William B. McLean Laboratory.*



Second generation British submersible

British Aircraft Corp. is building a more powerful version of its *Consub* unmanned submersible. The *Consub II* will operate to a depth of 2,000 ft in a 2-knot current. The heart of the vehicle will be a rotating platform with a television camera mounted on it.

Reconnaissance vehicle for depths to 6,000 ft

A second generation unmanned submersible was designed by **Perry Oceanographics** for reconnaissance to depths of 6,000 ft. The *RECON IV* will be equipped with low-light level still and television cameras and a manipulator.

The unit is 5 ft long, 4 ft wide and 3 ft, 9 in. high. It weighs 900 lbs. fully outfitted. The vehicle has a maximum speed of 2½ knots. *RECON IV* is deployed from the support ship in a special frame. When it reaches operating depth, the unit separates from its frame and works within a 400-ft radius of the frame. The frame thus takes up any motion caused by the umbilical cord from the surface support ship.

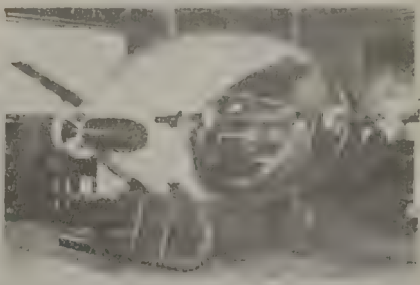
Perry also designed a *RECON III* submersible for deployment from a manned submersible. The *RECON III* is a smaller version of the *RECON II*. (*Ocean Industry*, October 1976)

Undersea tractor made with second-hand parts

The *RUM* (Remote Undersea Manipulator) vehicle was fabricated by scientists at the Marine Physical Laboratory, Scripps Institution of Oceanography, using the lower part of a surplus U.S. Marine Corps tank. Two 7½-hp DC motors were added to drive the tracks at a speed of 0.8 knot over virtually any kind of bottom naturally encountered while towing the *ORB* (Oceanographic Research Buoy). Total cost of the unit, built in two stages, is about $400,000. (*Ocean Industry*, March 1976)

Newest Soviet submersible

The three-man submersible *OSA-3-600* was designed by the Moscow branch of the **Giprorybflot Research and Design Institute of the USSR Ministry of Fisheries** for use by the National Research Institute of Sea Fisheries and Oceanography. The vessel has a speed of 3 knots and is capable of reaching 600-ft depths. The systems were successfully tested in the Black and Baltic seas. (*Ocean Industry*, January 1976)

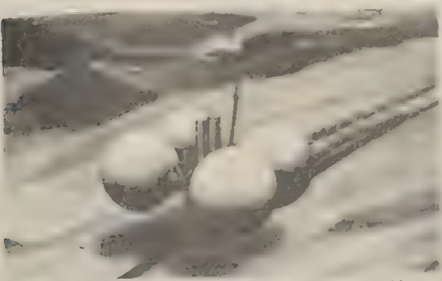


Observation submersible

Mitsui Ocean Development & Engineering Co., in cooperation with **Mitsui Shipbuilding & Engineering Co.**, **NAC, Ltd.**, and the **Japanese Ship Machinery Development Association**, developed the *Eye Robot* for observation at 100-m depths within a 100-m radius of the mothership. The vessel can buck a 2-knot current. It has two reversible thrusters that can be tilted from a horizontal to a vertical position. The color television system requires eight 500-watt halogen lamps. (*Ocean Industry*, June 1976)

Norwegian Firm Develops Deepwater Trenching System

A remote-control machine capable of burying oil and gas pipelines beneath the seabed at depths of up to 1,600 feet has been developed by the Norwegian engineering firm of Kvaerner Brug A S. Radically different from existing trenching equipment and able to operate at far greater depths, the device — called the Kvaerner Myren Trenching System — was developed under a commission from the Norwegian government as a practical solution to the problem of piping North Sea oil onshore to Norway across the 1,000-foot-deep Norwegian Trench.



Artist's rendition of remote-controlled Kvaerner Myren Trenching System, developed to bury oil and gas pipelines at depths of up to 1,600 feet.

Attached to a mother ship by a control cable which directs the excavator's eight propeller-thrusters, four spherical ballast tanks, clamps and digging head, the trencher descends to the ocean bottom, "homing in" with radar and television on the prelaid pipeline to be buried. The machine then grips the pipe with four pairs of wheels and rides slowly along the pipe, using it as a rail, digging and burying as it goes. Maximum trenching speed is about 1,600 feet per hour.

Because the machine is made "weightless" through adjustment of its ballast tanks, it rides along the pipe without any contact with the ocean floor, other than with the digging head and burier. As the cutting tools are mounted a fixed distance away from the gripping wheels which hold the pipe, there is no possibility that the pipe will be accidentally cut by the trencher. Perhaps most important of all, there is no need for divers' assistance, as the machine is unmanned and can, in an emergency, be floated to the surface by emptying its ballast tanks.

Tests conducted using a one-fifth size working prototype of the trenching system [illegible] success, as the machine buried a 500-foot-length of 5-inch pipeline on the floor of the fjord. Full size, the Kvaerner Myren system will weight 50 tons and measure 26 by 29 feet. It can accommodate pipeline with diameters ranging from 1.3 to 3.9 feet.

$10 'WRISTWATCH'

Device Will Tell Where You Are

By CLIFF SMITH

Science Writer, The San Diego Union

Within 10 years hikers may be able to buy a $10 wrist device that will absolutely guarantee that they will never get lost.

Dr. Ivan Getting, president of the Aerospace Corp., described how the system will work yesterday at a meeting of more than 400 navigation engineers from all parts of the United States.

Getting said the [illegible] for the position finder exist today and that the last barrier to putting them into operating position will be [illegible] when the Space Shuttle flies in [illegible].

He said two satellites in stationary orbit 22,500 miles above the equator could serve most of the civilian navigation needs of the United States.

Initially, Getting [illegible] of the satellites will have cross-shaped transmission antennas [illegible] feet long and two feet wide.

One of the satellites [illegible] beam 10 miles wide at the [illegible] reaching from [illegible] to Mexico. The other satellite would make the same shaped beam reaching from coast to coast.

10-Second Sweep

Both beams would sweep back and forth from border to border and from coast to coast every [illegible] seconds.

Then if you were carrying [illegible] wrist radio you could [illegible] your position in any direction within one-half mile, Getting said.

He said the [illegible] will have a payload to permit the deployment of [illegible] antennas considerably larger. If the cross-shaped antennas were made two miles long rather than [illegible] feet, he said, you could [illegible] your position [illegible]

[illegible] to [illegible] Getting said. [illegible]

For the military, [illegible] sooner.

Global Positioning Satellite

Late next year [illegible]

[illegible]

[illegible] of one foot in any kind of weather.

[illegible] today, Getting said, and the [illegible] system is [illegible] dimensional, and has weaknesses when used on fast-moving targets.

The meeting addressed by Getting [illegible] It is called the [illegible] Symposium. The sponsors are the Institute of Electrical & Electronics Engineers and the [illegible] Systems Society.

Spy Vessel Storage Due

LONG BEACH (AP) — The Glomar Explorer, a Central Intelligence Agency spy vessel that helped retrieve part of a sunken Soviet submarine two years ago, will leave Long Beach for mothballing Tuesday, a Navy official said.

The 618-foot ship built by the late Howard Hughes' Summa Corp. will be deactivated at the National Defense Reserve Fleet in Suisun Bay east of San Francisco Bay.

Capt. Samuel W. Galstan, deputy regional director of the U.S. Maritime Administration in San Francisco, said the vessel will be laid up in December.

Dismantling of the Explorer's massive derrick towers was completed Wednesday at the U.S. Naval Support Facility Mole on Terminal Island.

A 386-ton, German-made floating crane, believed to be the world's largest, was used to dismantle the towers.

A shipyard official said the towers had to be dismantled so the vessel could pass under the bridges en route to San Francisco Bay.

Navy Team Recovers Missile Lost In Atlantic

LONDON (AP) — A U.S. Navy recovery team retrieved a secret Phoenix missile yesterday that fell off an aircraft carrier with an F-14 jet fighter six weeks ago and plunged to the bottom of the North Atlantic.

The recovery just before dawn capped weeks of battling the ocean to find and raise the missile, lost when the F-14 rolled off the carrier John F. Kennedy during a NATO exercise on Oct. 14.

Soviet Intent Feared

The air-to-air missile had a conventional warhead, but would have been an intelligence prize for a potential adversary. The Phoenix-equipped F-14 is one of the Navy's major weapons in defending ships against missiles and planes.

There had been fears that Soviet ships would attempt to recover the plane from the bottom of the sea. President Ford ordered the Navy to recover the plane before other nations could attempt salvage.

The retrieval team was hampered by 10-foot waves and 50-knot winds, a Navy spokesman said. Renewed efforts to raise the F-14 were awaiting improved weather.

San Diego Craft Involved

An NR-1 deep-diving submarine — a small diesel-powered craft with five crewmen, a television camera and portholes for searching — found the missile Saturday under more than 1,900 feet of water about 75 miles northwest of Scapa Flow, Scotland, the spokesman said.

The NR-1, which located the plane after a robot minisub from San Diego failed, grasped the 13-foot-long missile with a remote-control grappling device and brought it to the surface.

Divers then attacked straps to it and the missile was hauled aboard a U.S. Navy ship assisting the salvage operation. The missile was only slightly damaged, Navy spokesmen said.

Automatic underwater tracking system

Wesmar's advanced sonar tracking system is designed for navigation, survey, tracking of manned and unmanned submersibles, as well as locating wellheads and other subsea equipment. The system features three modes of operation—Transpond Hi, Transpond Lo, and Autotrack—along with a patented stabilization system which compensates for a full 25 degrees of vessel pitch and roll.

Manipulator and tool system

The Deep Submergence Work Package (DSWP-51) is an electro-hydraulic manipulator and tool system designed by **Perry Ocean Products** for refitting submersibles. The manipulators and tools are operated by joystick controls mounted on a portable console. The unit can work **at 1,500-ft depths** and can be designed for **3,000-ft depths. The system has** a maximum lift of 150 **lbs. while fully extended.** (*Ocean Industry*, June 1976)

From DEEP SUBMERGENCE BULLETIN 1/1, by USN Commander Submarine Development Grou
One, San Diego

Title of Submission: FREE SURFACING RECOVERY SYSTEM

Deep Submergence System Category: MANNED SUBMERSIBLES

Subsystem Category: UNDERWATER WORK/RECOVERY SUBSYSTEM

Technical Discussion: The Free Surfacing Recovery System was developed primarily to free the submersible following hook up to objects to be recovered. It will replace the present method whereby the submersible is required to unspool recovery line to the surface from a reel attached to the submersible The new recovery system consists of a special frame and buoyant reel which can be disengaged from the support frame by rotating the line yoke to the release position. Since the reel is buoyant, it remains engaged until the submersible backs up and away following the hook up. The manipulator is used to pull the locking pin which in turn permits the reel to free surface where a crew secures the reel to a float. Developed for use with submersibles TURTLE (DSV-3) and SEA CLIFF (DSV-4), the system is intended for recovery at depths of 6,000 feet and features KEVLAR synthetic cable which has a breaking strength of 12,000 pounds. The system was designed and fabricated by the Civil Engineering Laboratory, Port Hueneme, for the Pacific Missile Test Center, Point Mugu, for use on the underwater range in Hawaii. Currently, the system is undergoing minor modifications and improvements.

Status: Available 1 July 1976

Disposition: Unit Equipment, SUBDEVGRUONE

Orignial Cost: $35,550

PIG PINGER & MODIFIED PINGPOINTER USED IN PIPELINE APPLICATION

Helle has modified its standard Pingpointer Model 6360 for easy attachment to the manipulators of a submersible in tracking pigs "stuck" in pipelines. As the submersible scans the pipeline, the modified unit can home in on the Helle Pig Pinger Model 2439 (frequency-12 kHz) attached to the lost pig. The modifications entailed special tuning of the pingpointer to home in on one frequency of 12 kHz instead of a range of frequencies 24-50 kHz (which is available on the standard pingpointer model). Other adaptations included a rugged anodized aluminum housing and two transducers on each end of the unit. The tranducers are salt water activated when submerged in the water. The basic application of the standard pingpointer is applied to the modified pingpointer. There are two lights on the face of the instrument. When the submersible is aimed at the pinger, the light on the side closest to the pinger will blink. By slowly rotating the submersible on its vertical axis, the operator can home in on the pinger and to the "stuck" pig. The modified pingpointer was built to our customer's specifications. For more details contact Helle.Engr.

The Perry Oceanographic Inc. PC-16 submersible has won the coveted I-R 100 award in Chicago. The award was presented at the Museum of Science & Industry in Chicago to Bruce C. Gilman, executive vice president of the company.

The submersible is the first vehicle of its type to be used in depths of up to 3,000'.

The hull, consisting of three 72 inch diameter steel spheres, is 25' long and weighs 16 tons. The forward compartment houses the pilot and controls, and the aft compartment carries the propulsion machinery. The submersible's center compartment is unique. It is designed to allow dry transfer of personnel at atmospheric pressure to 3,000'.

According to Perry Executive Bruce Gilman, oil companies are going deeper and deeper in the sea in their exploration for new oil sources and require support systems such as the PC-16.

The submersible is currently being used in the Straits of Scilly for route surveying on the Trans Mediterranean Pipeline Project.

INTERSUB of Marseille, France, PC-16's owner, has contracted with Snam-Progetti to map the sea floor topography in water depths to 2,200 '. The submersible's spacious center compartment provides ample room for tracking gear and supplementary electronic instrumentation required for the survey.

Intersub's support ship for PC-16, INTERSUB 4, is a 249' former stern trawler that has been specifically converted for submersible handling. The ship is equipped with an omnidirectional bow thruster, hydraulic handling system, submersible hanger and workshops and an on board computer system for integration of ship and submersible positions. Launching and recovery operations are possible in up to sea state 6.

Four personnel can stay submerged for 6 to 8 hours during a mission. The mid compartment is converted to a dry transfer configuration by the addition of a skirt attachment to a bottom flange. Following the docking on a subsea chamber, the skirt is depressurized to atmospheric pressure and the seawater pumped out. Technicians can then open the lower PC-16 hatch and chamber hatch and transfer in a "shirt-sleeve" environment to the seated work area. Intercompartment hatches isolate the midcompartment where the electrical design meets Coast Guard requirements for an explosive-proof environment.

Other noteworthy features of the PC-16 include two multi-function manipulators, a 30 inch diameter panoramic forward viewport and a 6 viewport conning tower. Individually droppable battery pods, a life support system with a 7 day reserve and a leak detection system, provide a high degree of safety to the crew.

The structural design of the PC-16 includes the use of a digital computer to perform a finite element analysis on the hull spheres. A relatively new procedure, the analysis allows the structural engineers to more accurately predict the discontinuity stresses that occur at shell reinforcement intersections. As a verification to the analysis, the completed hull was subjected to a hydrostatic test to an equivalent depth of 3,750'.

A 10 horsepower electric motor propels the PC-16 to a maximum speed of 3 knots. Lead-acid batteries contained in the twin battery pods provide 52 KWH of power for propulsion and on-board equipment.

Exceptional maneuverability is provided by a reversible thrusters, 2 of which are mounted in the bow planes for orientation in either a horizontal or vertical plane. The PC-16 may be flown over the bottom on thruster power alone by varying the bow plane angle to follow the sea floor contours.

MARINE
TECHNOLOGY
SOCIETY

SUBMERSIBLE SOUNDINGS

A Newsletter of the MTS Professional Committee on Undersea Vehicles
No. 4 -- 12 November 1976

SPECIAL BULLETIN: Our Committee has received a $30,000 contract jointly sponsored by USCG, Navy and NOAA to develop submersible safety standards. The project plan is described in J. Pritzlaff's paper 24F listed below. Progress reports will be given in future newsletters.

- Ralph Draper -- Portsmouth Naval Shipyard, Portsmouth, N. H. -- reported premature failure of third silver-zinc battery aboard USS DOLPHIN -- ship now operating, at least on an interim basis, with lead acid batteries. Portsmouth Naval Shipyard currently involved in redesigning batteries for SEA CLIFF and TURTLE. On life support -- NRL, working with Foote Mineral (supplier of LIOH for life support systems), feels a solution has been found to the low absorption rate of LIOH which has caused the DSRV's to abort several dives. Info requested by L. Shumaker -- containers of LIOH, which have been tested by NRL and found to have low absorption rates, bore contract dates of 1974 and 1975.

- Bill Searle -- William Searle Associates -- reported on NAE study concerning extreme hazards of AC circuits in sea water. Some underwater vehicles he has surveyed do not have AC circuits adequately protected. Insurance surveyors will ban the use of divers in the water if AC circuits do not include Ground Fault Interrupters (GFI) even though they have Ground Fault Detectors (GFD).

Deep Ocean Technology Handbooks — information courtesy of [illegible] — thanks, Bob. The previously published handbooks prepared under the direction of the Naval Sea Systems Command include:

1) Handbook of Electric Cable Technology for Deep Ocean Applications. NSRDC(A), 8-54/70, November 1970. Revised 1973 AD [illegible].

2) Rotary Shaft-Seal Selection Handbook for Pressure-equalized, Deep Ocean Equipment. DTNSRDC(A), [illegible], October 1973 AD [illegible](L).

3) Handbook of Vehicle Electric Penetrators, Connectors and Harness for Deep Ocean Applications. July 1971 AD [illegible].

4) Handbook of Fluids and Lubricants for Deep Ocean Applications. DTNSRDC(A), MATLAB 360, Revised 1972. AD 893-990.

5) Handbook of Fluid-Filled, Depth/Pressure-Compensating Systems for Deep Ocean Applications. DTNSRDC(A), [illegible], April 1972. AD [illegible].

6) Handbook of Electrical and Electronic Circuit Interrupting and Protective Devices for Deep Ocean Applications. DTNSRDC(A), [illegible]. November 1971. AD 889-829.

7) Handbook of Underwater Imaging Systems Design. NUCTP 303. July 1972 AD [illegible] (L).

8) Handbook of Pressure-Proof Electrical Harness and Termination Technology for Deep Ocean Applications. NAVSEA [illegible]-010, August [illegible]

Copies of above handbooks may be obtained from:

Defense Documentation Center

Cameron Station

Alexandria, Va. 22314

In addition, the following have just been published:

9) Handbook of Electrical Insulating Materials for Deep Ocean Applications. [illegible], June [illegible].

10) Revision to #5 (previously listed [illegible] Pressure Compensating Devices), which consists of an addition of a chapter on Submersible Cases [illegible] August 1976.

[illegible] handbooks (#9 and 10) can be obtained from the above address. Two more handbooks in the works are:

11) Handbook of Submersible Electric Drive Systems for Deep Ocean Applications -- expected out about January 1977.

12) Revision of #4 (Fluids and Lubricants) -- expected out about June 1977.

Some recent information on Soviet activities is provided by Lee Boylan (Informatics, Inc.).

1) Several brief newspaper items published in late September indicate that the Soviet Union's self-propelled sealab "Bentos-300" has recently undergone testing in the Black Sea. Bentos-300 is 30 meters long, [illegible] meters high (o.a.), has a crew of 12, and has a stay-time (endurance) of 10 -- 12 days. Maximum submergence depth given for Bentos-300 is 400 meters (100 meters deeper than was originally planned). The vehicle (or mobile habitat) has a lock-out capability and a self-surfacing rescue capsule which can carry the entire crew to the surface in an emergency. Following its tests, Bentos-300 will be put into operation by the Sevastopol Branch of the USSR Ministry of Fisheries' Special Experimental Design Agency, for use in fisheries-related research.

2) A recent report reviews the highlights of a seminar on the use and effectiveness of submersibles, held in Leningrad in November 1975. The seminar was attended by 150 representatives from 36 organizations, and 25 papers were read.

The report states cryptically that at the present time, of the 2[illegible] submersibles built in the USSR, 18 belong to the Ministry of Fisheries. Unfortunately, there is no indication of the time frame meant by 'present' nor of the vehicles (habitats?) considered in the total count. Severyanka and Sever-1 (1958 and 1967, respectively) are mentioned, along with Sever-2, TINRO-2, OSA-3, and the Atlant-1 and Atlant-2 towed vehicles. A paper by V.K. [illegible] (Special Experimental Design Agency of the USSR Ministry of Fisheries) clears up a previous question on the number of Atlant-2 towed vehicles built, by stating that the Atlant-1 and Ictis towed vehicles are being used in the study of trawl behavior, while TINRO-2 and Sever-2 are being used for biological research due to their low maneuverability.

Four papers were devoted to the Shelf-[illegible] program (USSR--Bulgaria) and to the Institute of Oceanology's "[illegible]" program involving the use of the [illegible] (Argus) and Pisces submersibles. The former weighs 9 tons, has a submergence depth of 600 meters, a speed of 1.5 meters/sec, and life-support endurance of 72 hrs for a [illegible] crew. At the time of the seminar, [illegible] had not yet been installed in Argus and Pisces, and [illegible] in the design stage.

[illegible]

[illegible]

[illegible]

Skat has the following basic systems:

1) A program system containing a microprogramming unit to generate the programs for vehicle motion and systems operation;

2) A system for controlling the programmed motion, which includes transducers and controllers for vehicle motion parameters, signal amplification and shaping circuits, and four stern-mounted propulsion units;

3) A hydroacoustic navigation system consisting of a vehicle mounted transducer, two radiotelemetering buoys equipped with acoustic transponders, and a receiver/plotter unit on the support ship;

4) Ballast and emergency systems; and

5) Research instrumentation and recorders to measure physical and chemical fields, a photoflash camera unit, a mag tape recorder, and (according to earlier press coverage) a side-look mapping sonar,

In operation, the buoys are set out and their positions determined. The desired motion parameters are then entered into the program unit. The vehicle can follow a variety of cruise patterns at a fixed depth, with each pattern controlled by its own program. For near-bottom photography, Skat can cruise at a fixed height over the bottom.. Using the "surface effect", the vehicle's motion near the bottom (0.2--0.3 m) is stable due to its flat-bottomed hull.

Skat was tested in 1973-74 in the seas of the Soviet Far East and in Lake Baykal, where it was used to study water pollution generated in the lake by a pulp plant. These early tests demonstrated Skat's effectiveness in performing hydrochemical surveys in both horizontal and vertical scales, and in geologic and cartographic missions.

The majority of the papers read at the seminar touched on problems of optimum vehicle use and new methods for evaluating the comparative economic effectiveness of submersibles. The necessity for viewing the submersible and its support ship as an integrated research unit which, even in the early planning stages, should incorporate provision for special equipment (particularly, a shipboard diving system), was stressed.

A paper by A. A. Shilvan (Giprorybflot — Leningrad) proposes a series of mathematical relationships for determining submersible/support ship operating costs, which comprises one of four components of the criteria for submersible effectiveness. These make it possible to select the optimum design out of a number of comparable designs, even in the feasibility study and preliminary design stages.

In conclusion, it is mentioned that consideration is being given to the development of modular submersibles for exploration and fundamental research to depths of 1000 - 1500 meters. The need for effective program development and advanced instrumentation is noted, and poor coordination within various fisheries organizations and other agencies in the areas of submersible development, personnel training, and program performance is cited.

Changes to Address List

KISHEL, Joseph M. (vice "Michael J.)
(ex-SEALINK I,II; DDS CONSTRUCTOR)

Res: R.R.#13
Thunder Bay
Ontario, CANADA P7B 5E4
(807) 683-5452
Bus: Deep Diving Systems, Ltd.
P.O.Box 717
Thunder Bay P.
Ontario, CANADA
(807) 344-7621

SHILLER, Gerald I.
(NEKTON)

Res: 2087 Manchester #1
Cardiff-by-the-Sea
California 92007
(714) 436-4629
Bus: General Oceanographics, Inc,
11578 Sorrento Valley Rd., #25
San Diego, Ca. 92121
(714) 452-9540

Additions to Address List

CHAMBERS, Francis J. (Frank)
(PISCES IV)

Res: 1196 Highrock Avenue
Victoria, B.C., CANADA
( ) 836-9677
Bus: Environment Canada Ocean &
Aquatic Service
512-1230 Government Street
Victoria, B.C., CANADA
( ) 656-5611

SANDERSON, Ian
PISCES IV)

Res: 4152 North Road
Victoria, B.C., CANADA V8Z 5H8
( ) 479-2099
Bus: Environment Canada Ocean &
Aquatic Service
512-1230 Government Street
Victoria, B.C., CANADA
( ) 656-5444 or 5611

REES, Bob Gary (LCdr., USN)
(ex-DSV-3 TURTLE)

Res:

Bus: ComSubDevGru One
FSFC San Diego, Ca. 92132
(714) 225-6583

HOYT, Carroll L. (Associate Member)
(NEKTON , ,)

Res: 1253 Felicita Lane
Escondido, Ca. 92025
(714) 743-1928
Bus: General Oceanographics, Inc.
11578 Sorrento Valley Rd. #25
San Diego, Ca. 92121
(714) 452-9540

DEEP SUBMERSIBLE PILOTS' ASSOCIATION

NEWSLETTER

May, 1977

Vol. XI, No. 2 Published by the Deep Submersible Pilots' Association

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and material in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER should be addressed to:

Robert K. R. Worthington (714) 453-1158
Secretary & Editor, DSPA
3005 Curie Street
San Diego, Ca. 92122

Correspondence regarding new member applications should be addressed to the Membership Committee Chairman as follows:

Willis Forman (714) 273-2967
3940 Sioux Street
San Diego, Ca. 92117

EDITORIAL NOTES AND COMMENTS

News contributions from members have been sparse of late. Apparently, there is so much going on that there is no time to write. It couldn't be that there just isn't anything to write about - no operations, no problems, no solutions, no news!

Our peripatetic Jim Helle continues to be busy as a flea between his San Diego base, his new Aberdeen (Scotland) plant, and his worldwide sales operations. Seems only a year ago that he was complaining of being becalmed in the doldrums. Keep charging, Jim; but we would like to see you at a San Diego luncheon again.

Welcome on board to our new members--de Froberville, Newell, Olson, Bradley, and Bouet-Williamez. This is a really select group in the undersea game as evidenced by their affiliations shown in the address list addition in this NEWSLETTER.

No word from Mike Macdonald regarding his activities since leaving HYCo. Report in, Mike!

Scuttlebutt via Kirk Newell and a National Geographic photographer re ALVIN's deep ocean "hot springs" was confirmed in the SCRIPP's news release carried in this NEWSLETTER. We'd all appreciate some inside dope from ALVIN.

DSPA regrets losing Bland and Toggweiler as members due to non-payment of 1976 dues, the first drop-outs in years. Sorry to lose old friends.

Don Keach, fortunately, was passing through San Diego at the time and attended the monthly DSPA luncheon meeting. These get-togethers are highly interesting and useful and are made even more so by the presence of out-of-towners. Any members of able to include San Diego in their itinerary advise your Secretary direct/through any local member, and we will attempt to schedule a meeting accordingly. The upcoming meeting will be held around 15 May if we can determine when Larry Shumaker will be in town.

DSPA REPORTS AND NOTICES

Dues - 1977 membership dues are in arrears for the following members:

Beachler
Boggs
Boulton
Johnson
Merritt
Smith, Mike
Starr
Toler
Vernon
Wilson
Slater

Please remit to the DSPA Secretary either funds or rebuttal if you believe you are paid up. Dues remain at $5.00 for US/Canada mailing addresses and $10.00 for overseas.

Elections - no comments were received from membership at large, so 1976 officers will continue through 1977 as recommended by the San Diego group.

Symposium-Energy Research in the Oceans will be held by SNAME in cooperation with ASCE, IEEE, and MTS at the Fairmont in San Francisco 25-27 May 1977.

San Diego Luncheon Meeting at Tarantino's on 1 March 1977

Members Present
J. Cameron
R.K.R.Worthington
W. Forman
C. Hoyt
J.K.Newell
M.T.Smith

Non-Members Present	
LCDr.Dick Taylor -	XO-USS DOLPHIN XO-DSRV-1
D.J.McCafferty	Master, R/V TRANSQUEST
M. Wills	Mate, R/V TRANSQUEST
P. Severtson	Lockheed - DEEP QUEST

It was noted that J. Helle and D. Saner were absent on business travel. The Secretary described the business discussed at the 2/22/77 Board Meeting with particular regard to the matter of elections for 1977 DSPA officers. The concensus of members present was that the present officers should be retained and early elections held for 1978. Larry Shumaker's letter of 18 February concerning ALVIN operations was read. Acceptance of five new members was announced by the Membership Chairman, Will Forman, to wit: Dick Olsen - NEKTON, LCdr. Kirk Newell - OIC TRIESTE II, Gerard C. de Froberville - Societe Generale de Recherches et d'Exploitations Mimeres, Vance Bradley - Intersub Ltd., and Olivier Bouet-Williamez - Intersub Ltd. Kirk Newell was the only one of these members present and was welcomed with the presentation of the last DSPA pin on hand. A new supply will be procured as soon as possible (an investigation now in process to locate the die for the original supply). Carroll Hoyt described forthcoming operations of NEKTON expected to provide an economical new technique for offshore oil field development. He graciously extended an invitation for all present to visit General Oceanographics on 2 March for familiarization with NEKTON and dinner as guests of G.O. Kirk Newell gave an account of TRIESTE's initial tests with her new support ship, USS POINT LOMA. TRIESTE will soon dive to 10,000 feet and then conduct an 18,000-foot dive 450 miles off San Diego. Pete Severtson mentioned that the DEEP QUEST tests of the DSRV Pratt & Whitney fuel cell would probably include a 72-hour dive! If the boat can stand up to it, can the crew?

San Diego Luncheon Meeting at Tarantino's on 12 April 1977

Members Present
R.K.R.Worthington
W. Forman
D. Saner - DEEP QUEST
D. Keach - USC
Lt. M. Smith - DSRV-1
C. Hoyt - G.O. Inc.

Non-Members Present
A.E.Witcombe - HYCo (TAURUS)
LCdr. G. Verd - USS DOLPHIN, C.O.
LCdr. R. Taylor - " " X.O.
A. Smith - Lockheed DEEP QUEST
P. Severtson - " " "
F. Simpson - Lockheed Ocean Lab.

This meeting was especially honored by the presence of Don Keach and Al Witcombe, initial visits for both. Don Keach described the organization and operations of the USC Institute for Marine Studies of which he and Don Walsh are Ass't. Director and Director, respectively. Don Keach is also Director of the Sea Grant Office. Their property supervision extends over a large portion of Catalina Island among other things and both Don's teach as regular members of the University professorial staff. Al Witcombe is engaged in shakedown of DS/V TAURUS for HYCo at the U.S.C. Catalina Island facility earlier used by BEAVER. TAURUS is engaged in testing her ocean bottom wellhead mating device which permits dry transfer to a wellhead capsule. This adapter device is dived, maneuvered, and attached to the wellhead through umbilical controls by the co-pilot in TAURUS. Al indicated his intention to apply for DSPA membership. George Verd reported that DOLPHIN's replacement of her silver-zinc battery with old reliable lead-acid batteries resulted in a great improvement in dependable operating time.

The Secretary reported receiving no comments on DSPA election preferences from members and no progress in re-ordering DSPA pins. Dick Hegeman has returned to Santa Barbara from field operations and is tracking down the identity of the original vendor. Don Rosencranz's completion of Washington duty and return to his home base at NUC in Kaneohe Bay was noted. Don Saner reported a rumor that Larry Shumaker will be in this area about 15 May, and it was decided to try to have the next meeting at that time. A report from Kirk Newell on a discussion with a National Geographic photographer regarding news of ALVIN's discovery of warm water, H_2S-laden vents at 8,000 feet in Galapagos waters was described.

Meeting adjourned at 1345.

REPORTS FROM MEMBERS

On 3/2/77, Carroll Hoyt conducted a NEKTON briefing at General Oceanographics for J. Cameron, R. K. R. Worthington, W. Forman, J. K. Newell, and G. Ellis (TRIESTE II), after which Carroll and two of his pilots, including DSPA member Rick Olsen were dinner hosts for the group. The simplicity and ingeniousness of the NEKTON and her equipment and the innovative/low cost approach of G.O. personnel were impressive to the visitors. Hoyt emphasized that they are a small outfit but anticipate continued growth in both their submersible and surface research vessel operations.

On 4/7/77, Jim Helle reported that he was "up to his ears" with preparations for OTEC and the opening of a new Helle Engineering plant in Aberdeen, Scotland. According to Jim, the activity in the North Sea area is "unbelievable" with manned submersibles extremely busy, primarily Intersub and Vickers. However, the move is toward unmanned vehicles and "bells" (bathyspheres) because of high insurance rates and government over-regulation causing manned sub costs to reach prohibitive heights.

On 4/17/77, J. M. Kishel informed that CONSTRUCTOR should be ready for trials in a couple of months and that he'd be at O.T.C. in Houston at the Vector Cable booth with their new umbilical on display.

Don Rosencrantz says, "I'm out of Washington and back in Hawaii at my old address. I'm still with NUC and now trying to put together a program in better integrated displays for remotely piloted vehicles (a la RUWS, CURV, and commercial vehicles). So, I still have my finger in the pie near and dear to pilot's hearts." - Hey, Don, don't you know pie near the heart equals heartburn?

Larry Shumaker, way back in February typed, "I'm off for the Galapagos Islands next week to join ALVIN/LULU. ALVIN made her first dive in the Pacific yesterday and we will be diving there through mid-March before returning to the small pond. More dives are scheduled in the Cayman Trough followed by a month or so of varied work in the Bahamas area before returning to Woods Hole in late June."

R. Frank Busby Associates

MARINE SURVEYS, STUDIES & CONSULTING

- Pipeline Cable - Site
- OCS CZM

576 South 23rd Street
Arlington, Virginia 22202
Telephone: (703) 892-2888

Pyramid found under the sea

Mexico City.

A 600-foot high underwater pyramid has been discovered in the notorious "Bermuda Triangle," at the junction of the Atlantic and Caribbean, at a depth of nearly 3,000 feet.

American author Charles Berlitz, author of "The Bermuda Triangle" said that this discovery shows a highly developed ancient civilization once may have existed in this region.

The Bermuda Triangle, an area covering thousand of square miles stretching from Bermuda to the southeast coast of the United States and the West Indies, is reputed the site where dozens of vessels and aircraft have vanished without trace.

Tall Ships, Small Subs

Captain George W. Kittredge USN (Ret.)

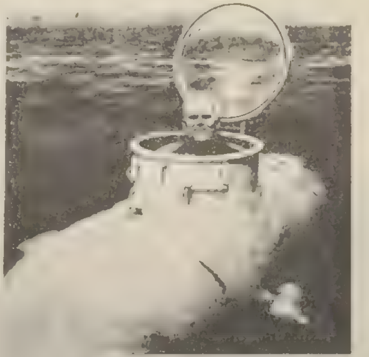
On the 2nd of July 1976, I received a telephone call from a member of the FBI.

"Captain," he said, "we have received a low level report that a terrorist group has gotten its hands on one of the small submarines you built and is going to try to disrupt the parade of Tall Ships in New York Harbor on the 4th of July. Could one of your submarines be used for a military type operation?"

I thought for a moment. One of my submarines. One of my little submarines, 10 feet 6 inches long and just big enough for one man to squeeze into. I had built the first one after I retired from the United States Navy because I wanted to see what was on the bottom of the ocean. During three submarine commands, I had never seen the bottom of the sea.

That first little submarine had been a pleasure to build. I built it in my garage. It isn't often that someone builds a one-man submarine in a small town in Maine, so almost every day, as the word got around, a visitor or two would drop by. Many of these men were lobstermen. Almost invariably as they turned to leave, they would say, "Do you think it will float?" At first I would shrug off the remark with a joke. But soon I got to thinking. These men were practical men. They had gone to sea all their lives. Maybe they didn't know anything about integral calculus but they had a good eye for small craft. Just to be on the safe side, I began to cut down on the fixed ballast attached to the twin keels in case I had made a mistake in my displacement calculations. Above all, I didn't want my first submarine to be too heavy.

When it was finished, I called it the Mk I and on the great day of the launching, several hundred people lined the banks of the Weskeag River at South Thomaston, Maine. Every kid in town was there. I rolled the trailer into the water and the submarine floated clear. I rowed out to it, got in and "rigged the boat for dive." Then I vented the main ballast tanks. The Mk I settled a bit in the water. So far so good. I began to flood the variable ballast tanks. Soon the variable ballast tanks were filled and still the submarine stayed on the surface. All systems worked but it didn't want to dive. I quickly blew all tanks, opened the hatch, and yelled to the kids to bring all the rocks they could find. Finally, with the bilges filled with rocks and a small boy standing forward of the conning tower and another small boy standing aft, I got the Mk I under.


The author in his mini-submarine

We re-ballasted the Mk I and it worked fine. After that came the Mk II and then the Mk III. We tested the Mk III to destruction in General Dynamics pressure chamber at Groton, Connecticut. Although the submarine was designed for a maximum depth of 250 feet, it withstood a pressure equivalent to 800 feet deep before the acrylic hemisphere that formed the conning tower hatch failed, and even that failed right where the calculations said it would. The sixth Mk III was classified A-1 by the American Bureau of Shipping. I sold the manufacturing rights to the Mk III for $100,000 and 17 years of royalties but the company lost its main line of endeavor (testing sonobuoys for the Navy) to a Texas firm so after three years I bought the business back.

"Captain," came a voice from the phone. "Captain, are you still there?"

"Yes," I replied, "I'm still here. I was just thinking."

"Well, what do you think? Could one of your K-250 submarines attack one of the Tall Ships?"

"No."

"No? Why not? David Bushnell's one-man submarine TURTLE did it in 1776. In the same harbor and against the EAGLE. You know, the lead ship is going to be the Coast Guard Training ship EAGLE."

"Let's just say there hasn't been much progress in midget submarine design during the last 200 years."

Complete silence on the other end of the line. Then, "Seriously, Captain. Could one of your small submarines carry out an attack? It would make headlines for some terrorist group."

"Not a K-250. A K-250 couldn't do it. They are strictly recreational. However, we are building ten, one-man submarines for a Norwegian firm to inspect off shore oil rigs. They have a 'claw' and might be able to do something disruptive but the prototype isn't finished yet. Now, if the FBI wants to place a limpet mine, or maybe a listening device, why I think we could—"

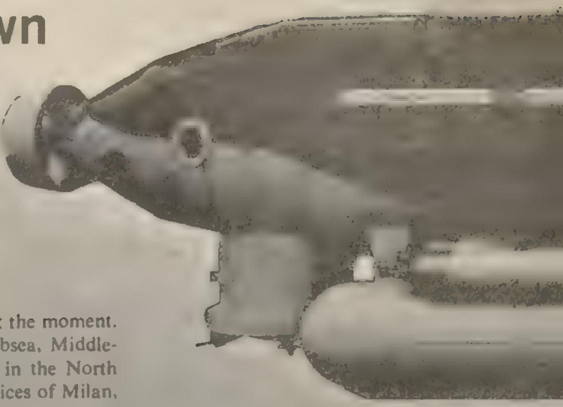
"Thank you, Captain. Thank you very much. Sorry to take up so much of your time."

⚓

Cosmic Dust or Fly Ash?

Tiny magnetic spherules are often found in marine sediments, and are generally assumed to be cosmic dust resulting from the combustion of meteors in the earth's atmosphere. Recently, however, Larry Doyle, Thomas Hopkins, and Peter Betzer of the University of South Florida Department of Marine Science, found quantities of similar spherules in plankton tows in the Gulf of Mexico. Chemical analysis shows abundant iron but negligible nickel, which appears to rule out cosmic origin. The investigators suggest instead that the material is fly ash from blast furnaces or power plants in Florida or Alabama, and they propose further that much previous work on cosmic particles was actually carried out on fly ash.

Manned Submersibles: Still In Demand Despite Offshore Slowdown



by Michael Mulcahy
Associate Editor

Perceptible change for the worse marked the business climate of the submersible field in the last 12 months. A dropoff in offshore drilling activity in the North Sea and elsewhere has produced a lower demand for submersible services.

Despite this, the relative market shares of the principal suppliers and users have been preserved. It appears that the market place will not improve dramatically in the near future, but there are some signs that indicate hope. Here we will describe some of the events of the past year, observe what trends are developing, and make a prediction of the short-term future of manned submersible operations.

By mid-1977 there will be some 78 manned submersibles operational around the world. As of this month there are approximately 56 in operational status, and 22 under construction or undergoing refit. The source of these numbers is a soon-to-be-released study for the U.S. Office of the Oceanographer of the Navy by R. Frank Busby.

In the U.S. the principal operators of manned submersibles are the military and academic communities. In Europe, industrial operators account for the majority of submersible activity. It is concentrated in the North Sea and monopolized by one company, Vickers Oceanics Limited, of Leith, Scotland. This company operates six submersibles in the North Sea. The company's closest numerical competition comes from Intersub Limited, Marseille, France. Intersub operates three in the North Sea at the moment. Also active are P&O Subsea, Middlebrough, U.K., with two in the North Sea, and Subsea Oil Services of Milan, Italy, operating one.

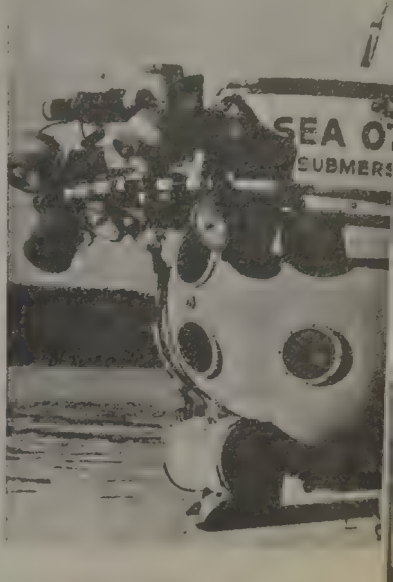
The oil industry's fortunes determine the utilization levels — and, moreover, the very existence — of a great number of submersibles. The requirements for submersibles in 1976 in the North Sea were down from 1975 levels, perhaps by as much as one-third.

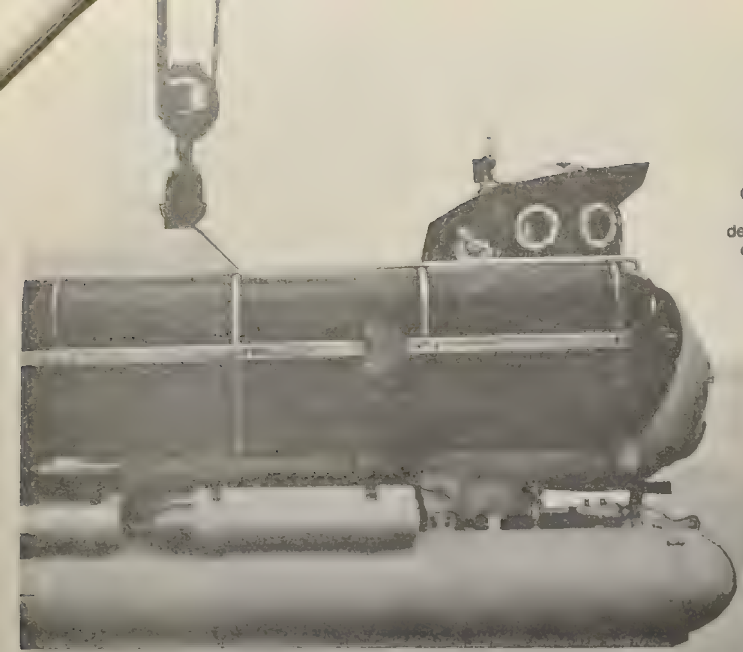
This magazine does not want to assign percentages of increase or decrease. For one thing, uniform criteria would have to be devised and applied to all operators. Simply stated, 1976 did not go as well as could have been hoped for oil-industry related submersible operations.

Why did this happen? It is a fact that in the North Sea the epoch of exploration has been supplanted by that of production. As a consequence many drill rigs are sitting idle around the world. As has been reported by this magazine in recent analyses of other offshore support industries such as commercial diving, demand for submersible time has decreased accordingly.

Perry Is Top In Subs

A U.S. manufactuer is at the top of suppliers, but its biggest customers are European. Perry Submarine Builders, Inc., Riviera Beach, Fla., delivered three new boats in 1976, all to European firms. Northern Offshore Limited bought the PC-16, a dry-transfer submersible, and the PC-1204, a 1,000 foot depth boat. Perry delivered the PC-1203, also a 1,000 foot observation submersible, to COMEX.

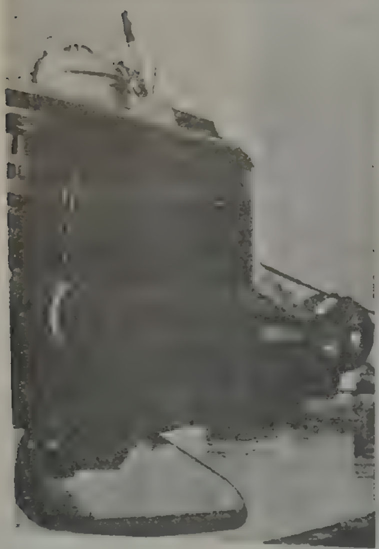




Left, silhouette of P&O Subsea's new submersible delivered to them in 1976 by builder Bruker-Physik AG, Karlsruhe, West Germany. With payload of 150 kg (331 lbs.), carries pilot and two observers. Operating depth is 260 m (853 ft.). Lower left, *Sea Otter*, operated by Can-Dive Services, Vancouver, during retrieval. Operating depth is 457 m (1,500 ft.). Crew capacity is pilot and two observers.

Three of the Perry PC-18 class boats are under construction. These are diver lockout models for operations to 1,000 feet.

There were some interesting developments involving submersibles in 1976. JIM, a one-atmosphere diving suit marketed by Oceaneering International, is really a manned submersible of sorts, in that it allows personnel to accomplish work underwater at atmospheric pressure and make visual observations without the bulk and time-consuming requirements of a saturation diving system.



In April, 1976, off Melville Island in Canada's High Arctic, JIM made four test dives totalling 14 hours 48 minutes at a depth of 905 feet. The dives were made through ice 16 feet thick in water -2.5°C (27.5°F). It was a record-setting depth. Although JIM is strictly speaking neither a submersible nor a diving suit (it is sometimes called a submersible with arms and legs), the dive in a harsh environment points up the alternatives facing a customer who needs a dive made deep into cold waters. He can employ a system such as JIM, divers, or a submersible — manned or unmanned. The major part of the work being done at present is being performed by submersibles.

The reason why submersibles have become so popular in Europe and not in the oil industry in U.S. waters is that Gulf of Mexico waters are generally warm, shallow and calm. North Sea waters embody the opposite of these characteristics. Down to a certain depth, divers are more competitive than submersibles. The operators' opinions of the economic crossover point in favor of submersibles varies with the company, but at least one company feels it is as shallow as 120 meters (394 feet).

Improvement is desirable in several areas of today's submersible community. One is in the degree of communication among operators to inform each other of improvements made in submersible design, operating procedures, etc.

Most operators are too preoccupied in acquiring new business and doing their own jobs to observe techniques and style of the competition. For example, at a recent international gathering to discuss submersible safety a European operator's delegate observed a fellow operator's deballasting system that was actuated without electrical connections. His own was dependent on electricity, therefore subject to electrical failure. He was extremely interested in applying this technique to his own submersibles. He had been ignorant of its existence before travelling to observe his overseas neighbors.

There is still no real central repository of technical information where submersible operators can exchange information helpful in keeping up-to-date. There is, of course, awareness of what the competition is doing to the extent that it bears on the acquisition of business, but other vital information could pertain to innovations in the operational safety and more efficient use of manned submersibles.

Although the 1976 volume of business in the field of manned submersibles failed to match the explosive growth of the past few years, there were isolated examples of brisk activity. General Oceanographics, Inc., (GOI), San Diego, Cal., operated three submersibles, the *Nekton Alpha*, *Nekton Beta* and *Nekton Gamma*. The total number of dives per boat and total underwater hours increased by around 25%, so much that all three boats were used, compared to only two in 1975. Dives increased from 145 to 271, an increase of 87%. Total underwater hours increased from 191 to 358, or 87%

The increase in GOI business is due to expansion into the offshore industry in the Gulf of Mexico — pipeline inspection, route survey, etc., observation and inspection work for the State of California, and offshore activity in the Santa Barbara area

Three to four years ago, the company's bulk of submersible work was scientific in nature. Now it is petroleum-related. But if there is increased emphasis placed on oceanographic research by the Carter administration, the pendulum could swing back in that direction, according to G. I. Shiller, GOI Operations Manager.

Perry is still building submersibles, although 1976 was a lighter year for this foremost constructor of undersea workboats. Three boats were delivered in 1976, vs. four in 1975. The company is still riding high on a wave of demand for its submersibles and diving systems.

International Underwater Contractors, City Island, N.Y., spent 1976 continuing the refit of the *Beaver Mark IV*, which will be operational again in the spring of 1977, after well over a year of refitting.

Southwest Research Institute has installed and tested a 36" acrylic bow window as part of the modification. In addition, reliability of the propulsion controls has been improved. *Mermaid II* performed some cable survey in the New York area and some salvage survey of the wreck of the *Andrea Doria*, the Italian passenger liner that sank off the entrance to New York Harbor in 1956.

The year 1976 was not a totally safe year for submersible operations. In an accident the full details of which have not been released, one of COMEX's *MOANA* series of submersibles was involved in a fatal accident in the early summer.

This brings to 8 the number of fatalities incurred in submersible-related activity over the past eight years. This assumes that at the time of the fatality, classified as submersible-related, the submersible was acting in its capacity as a submersible, and the person(s) who died played some vital role in its operation, launch or retrieval.

This figure of eight, while regrettable, is nowhere near the number of fatalities that have occurred in North Sea diving activities. Although the exact figure is a closely guarded secret, it is certainly greater. Between 1971 and 1975 there were at least 24 deaths due to North Sea diving activities. It is all but impossible to get a fix on the exact numbers, since the diving companies and their customers are understandably reluctant to release them.

Willingness to police itself and formulate operational safety standards distinguishes the submersible community. The Marine Technology Society's Subcommittee on Submersible Safety of the Undersea Vehicles Committee resolved at the Oceans '76 meeting to appoint key individuals from the com-

SYNTACTIC FOAM MATERIALS
FOR HYDROSPACE APPLICATIONS

- BUOYANCY MODULES FOR DEEPWATER RISER PIPES
- FLOTATION FOR SUBSEASYSTEMS (SUBMERSIBLES AND DIVING BELLS)
- DEEP SEA BUOYS

UP TO
30,000 FEET
(14,582 psi)

depth of utilisation (meters)	type	tested at (bars)	density
8000-10000	FM 300	1000	0,72
7000	FM 310	700	0,69
6000	FM 280	600	0,68
4000	FM 200	500	0,68
3000	FM 210	300	0,60
2000	FM 100	300	0,60
1500-2000	FSA-B 2000	250	0,50
1200	FSA-B 1200	120	0,45
600	FSA-B 600	80	0,40

SOCIETE NATIONALE DES POUDRES ET EXPLOSIFS
— DEPARTEMENT CHIMIE —
12, quai Henri IV PARIS - France
PHONE 277.15.70 - TELEX 220356 F

munity to gather information and inputs in three critical areas affecting submersible safety; come to a consensus on their relative importance and promulgate by 1978 recommendations affecting these areas to the community at large

The three areas of expertise are plans and personnel; operational plans and procedures; and equipment. Between October and December the first round of meetings was held in Boston; Edinburgh, Scotland; and Riviera Beach, Fla.

The meetings were chaired respectively by Larry Shumaker of Woods Hole Oceanographic Institution; John Pritzlaff of Westinghouse Electric Corp.; and R. Frank Busby, of R. Frank Busby Associates, Arlington, Va.

Reports reaching ST following these meetings were highly favorable, expressing a free interchange of international opinion on common problems affecting the safe operation of submersibles. One of the goals of these meetings is to achieve some degree of standardization of procedures, equipment and operational style around the world. For example, there is at present an astounding variety of techniques of lifting a downed submersible.

Some consider the rescue systems developed by the Harbor Branch Foundation, Inc., Fort Pierce, Fla., among the most advanced. They include:

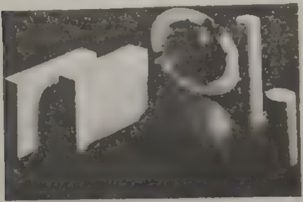
- A pilot-actuated rescue buoy;
- Deployment of a second submersible with a manipulator capable of light work in disentagling a fouled submersible;
- Dispatching a remotely-controlled unmanned underwater vehicle to the scene of the submersible in distress. It is fitted with a cutting tool, sonar and television, and controlled from a surface tender boat;
- Use of a "drop lock" lifting mechanism that spreads and locks after insertion in the female fitting on the downed sub. This means is also utilized for routine launch and retrieval of the submersible.

Gone are the days of the spectacular spurt of submersible construction and use of the 1960's when a number of corporations sponsored costly submersibles and the atmosphere in underwater operations was as competitive as an aquatic Soap Box Derby. This age spawned ***Star II, Star III, Aluminaut, Deepstar 2000*** and ***Deepstar 4000, Ben Franklin, Deep Quest.*** That whole generation of big, deep-diving boats was not too versatile.

Today the marketplace of submersible construction and use stresses versatility. It is a different world from that of less than 20 years ago. We are on the cutting edge of a new experience today. Needs of the scientific community are still being pursued and met insofar as possible, while the development of the east coast petroleum resource looms as a potentially lucrative endeavor for enterprising operators.

The working environment of the U.S. east coast is decidedly different from the calm, warm and pleasant waters of the Gulf of Mexico. Its demanding nature makes it analogous to the North Sea.

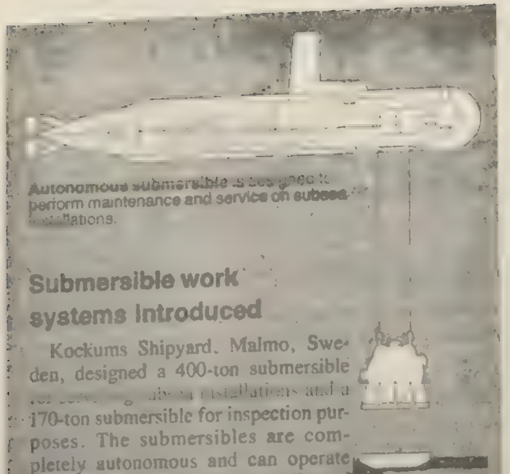
Submersibles will be called upon to do work not encountered before in the United States. Financial gain will come to companies able to offer submersible operations that are timely, abundant, logistically well-supported and capable of going as deep as necessary in some of the coldest, roughest waters on earth ▶



NEW BUOYANCY MATERIAL FOR DEEPSEA APPLICATION

ECCOFLOAT® EL is a series of high-performance syntactic foam blocks and shapes designed to give buoyancy to deepsea instruments and submersibles. A range of densities from 30-39 pcf corresponds to service depths from 12,400 to 40,500 feet. The material can be cut and machined with conventional tools. Send for new technical bulletin.

Plastic submersible? A large reduction in construction costs of submersibles may be expected if plans for the designing and building of a submersible of glass-fiber reinforced plastics are realized. A possible technological consultant for the project is the Jotun Group in Sandefjord, Norway, it was announced in Oslo recently. The man behind the idea is the famous submersible constructor Dr. Jacques Piccard. The submersible is expected to have highly sophisticated electrical instrumentation and mechanical equipment to enable it to perform all the necessary underwater operations. Such a submersible would be especially suited for inspection work in the North Sea. The construction could possibly take place before the end of 1978



Autonomous submersible is designed to perform maintenance and service on subsea installations.

Submersible work systems introduced

Kockums Shipyard, Malmo, Sweden, designed a 400-ton submersible for servicing subsea installations and a 170-ton submersible for inspection purposes. The submersibles are completely autonomous and can operate without a mother ship and regardless of surface weather conditions.

The two submersibles can operate several hundred nautical miles from their bases. The new systems are more economical to operate than the support-vessel system and they require a lower level of investment, says a company spokesman.

The 400-ton submersible is designed for maintenance and service of subsea installations. The vessel carries a crew of 12 and two four-man diving teams and can perform diver lockout operations to a depth of 300 m. Twin diving chambers allow the diving teams to operate independently.

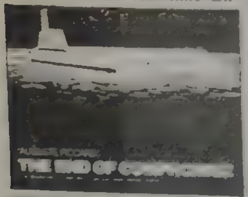
The 170-ton vessel carries a crew of 10 and is designed for inspection of underwater facilities to a depth of 200 m. The submersible can hover and is highly maneuverable. Both submersibles are built to Royal Swedish Navy safety standards.

Deep Quest Submersible To Test Fuel Cell Powerplant

The Lockheed research submersible *Deep Quest* will be the first ocean-test platform for the U.S. Navy's newly developed fuel-cell system that is designed to power rescue submersibles. Under a contract with the Naval Sea Systems Command, Lockheed is demonstrating the feasibility of the fuel-cell system as the primary source of electrical and propulsion power for a submersible. Although capable of operating to more than 2,440 meters (8,000 ft.) beneath the ocean surface, the *Deep Quest* will dive only to 1,525 meters (5,000 ft.) during the three-month demonstrations which will be conducted sometime this summer.

The fuel-cell powerplant makes electricity electro-chemically without normal combustion by consuming gaseous hydrogen and oxygen. The by-product is water. The system is completely self-contained and requires no outside power source to start or to operate. The fuel-cell power system, which includes monitoring and control equipment, will be used as a prime power for propulsion, lights, instrumentation, life support and other electrical requirements on the *Deep Quest* during the tests.

Underwater surveying now can be accomplished from a submarine that operates independently, requiring no surface tender. Horton Maritime Ex-



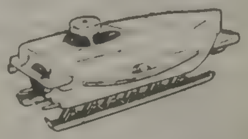
poration's Auguste Piccard is the largest operational civilian submarine in the world. It can operate underwater up to 18 hours/day at 2000 ft with up to 9 men (3 of whom can be observers)

Submersible activity. North Sea operations have resulted in a sharp increase in submersible activity. Until last year, InterSub of Marseilles was the only French company active in the North Sea with its Perry submersibles. Then Comex moved into the market with its own Moana vessels.

Comex has also just redesigned the remote-controlled *Telenaute*, which was created by Institut Français du Petrole. The vessel is now ready for service in Aberdeen under the name *TOM 300*. Comex also just brought out two new diving bells capable of descending to 1000 m. The *MOB 1001* and *MOB 1002* are now working for CFP and Getty Oil.

All this activity is going on at a time when offshore oil and gas exploration in France has come to a complete standstill and French industry is suffering from buying policies in Britain and Norway.

There are signs that the North Sea equipment market is picking up again and it will only be a matter of a few years before French companies can start exploring in the deep waters of the Mediterranean Sea and the Western Approaches.



Sub for Gulf of Mexico operations

Taurus I latest in the line of submersibles by **International Hydrodynamics Company Ltd. (HYCO)**, has a design depth of 1,200 ft (366 m) and features diver lockout and a dry transfer chamber. While designed initially for the Gulf of Mexico fields, *Taurus I* can be broken down into component loads for large transport-type aircraft with the result that this most modern of submersibles is available for international service. With its dry transfer chamber workers can be transferred in shirt-sleeve comfort to their stations on the sea bottom.

Submersible-to-wellhead 'wet' transfer system developed

Kenneth Ball, Director, Intertek Technical Services, Ltd.

Britain's first subsea access system is now under construction. The system will operate completely flooded. Vickers-Intertek, the builder, believes that existing submersibles or diving bells must be able to lock onto the subsea unit, thus saving large mobilization costs which would be needed with rival systems.

Choosing a subsea system. The merits and demerits of various forms of seabed-installed wellhead completions can give rise to many and equally varied arguments from economists, field development personnel and, not least, from the hardware and systems suppliers.

Generally, one feels that the oil industry would still, by choice, opt for platform-based wellheads if that were at all possible. The steady movement of interest to subsea wellheads is more an inevitability than a choice.

Downtime offshore costs money. When work has to be done to a wellhead offshore, two factors are important: speed of intervention and minimal cost of intervention.

Rapid intervention can be obtained in those situations where anchoring can be avoided.

One naturally looks to a dynamically positioned drillship as the ideal. Alternatively, a mothership for a submersible has the right characteristics in that it can provide the support of launch and recovery without being anchored or tethered to its submersibles.

While the submersible/support ship combination can be employed on other simple tasks or survey, inspection, cable laying and burial as routine work, it is difficult to conceive of a DP drillship being available at short notice, nor at a competitive price relative to the submersible support-ship combination or even a semi submersible with support fleet.

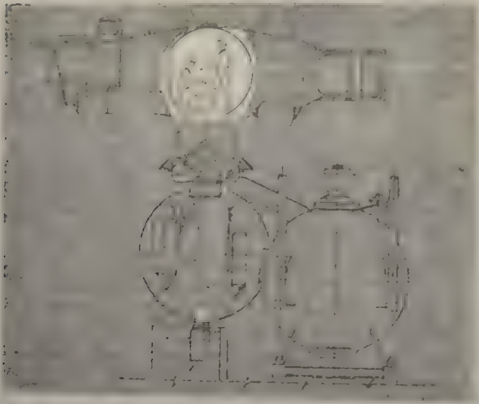


Fig. 1 Submersible mated to wellhead encapsulation

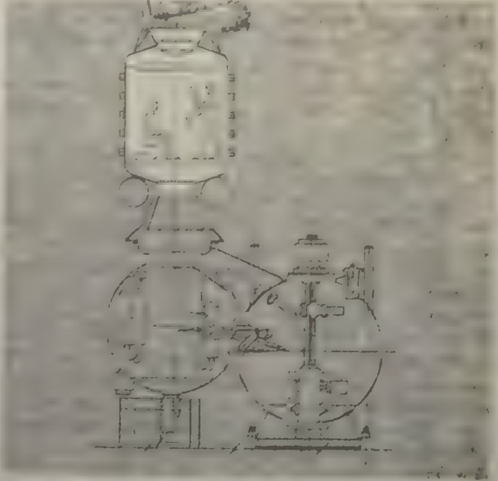


Fig. 2 Personnel transfer capsule can also be used

The cost of the overall recovery is obviously dependent on time as well as cost but significant savings can be made with respect to the amount of equipment needed for an intervention. The submersible/mothership combination has advantages in this respect.

However, this presupposes that the seabed installation can be assessed using a small submersible with very limited energy carrying capacity.

The Neutrabaric Method. One of the reasons for the growth in interest in the Neutrabaric method originally developed by Intertek Technical Services Ltd., of Liverpool, England, and now being offered to the industry by Vickers-Intertek Ltd., is that it provides the means whereby a small submersible with supporting mothership can move rapidly to site without any other support craft and launch, seek and locate its target, then mate onto and put men into a seabed-encapsulated unit with the minimum of time and energy expenditure.

The basis of the Neutrabaric method is that the pressure vessels encapsulating the wellhead are maintained full of water which acts as a fire and explosion resistant blanket and provides ready facility for contaminant purging. The water can be depressurized to nominally one-atmosphere pressure thereby removing all the inherent problems of hyperbaric diving. The Neutrabaric method may be thought of as the creation of "swimming pool" conditions at the seabed, but its true virtue is in the creation of a rapid, minimal cost way for tackling a very wide range of maintenance tasks which would otherwise need more elaborate facilities and a longer time scale of action to be fed into the recovery equation.

The illustration shows, in simplified form, a typical wellhead encapsulation with a small submersible mated-on, Fig. 1, and a personnel transfer capsule, Fig. 2. Note that the free surface of the water within the system is at the level of the submersible's lower hatch and that the combination of a dry workshop at one atmosphere pressure—the submersible interior—plus the water-filled Neutrabaric chambers provides the most versatile arrangement of contaminant-free working conditions.

The overall system is designed on an exchange-package basis so that seabed work time is minimized. To achieve this, complete electrical and hydraulic packages can be raised into the one-atmosphere dry chamber for disconnection and replacement while valve operators have been redesigned so that the operator can be removed without disturbing the bonnet flange or spindle seal of the valves themselves.

Vertical re-entry is provided for wireline purposes but in the event of a workover the complete encapsulated unit is removed in the manner of a wet tree so that a re-entry BOP can be positioned at the safest place—directly on the wellhead.

The Rebikoff DR-32 SEA SURVEYOR is a remotely operated vehicle capable of operations to 200 meters. It has videocameras and is designed for heliocopter support or transport.
Rebikoff Underwater Products-3060 S.W. 4th Avenue-Ft. Lauderdale,FL.-33315

Mr. Walt Thompson of Oceaneering International made a record dive to 1422' on December 11th in the JIM suit. It was for 2½ hrs. at the drill site of Discoverer 511 off the coast of Spain. It was for observation and deployment tests.
Oceaneering International-9219 Katy Freeway-Houston,Texas.

Intersub will soon have 7 submersibles with the arrival of two PC-18, and 5 Intersub motherships.

Mr. Bruce C. Gilman has been named President of Perry Oceanographics, Inc., Riviera Beach, FL. Mr. Gilman succeeds Mr. John H. Perry, Jr. who retains his position as Chairman of the Board.

The Stonington, Conn. Chevron Station on Alpha Ave. is a long way from the turquoise waters of the Aegean Sea and a most unlikely resting place for a submarine that was built at Electric Boat.

Yet, parked out back among the rusting hulks of vehicles that once made their way over local roads is the 16 foot ASHERAH, the smallest submarine ever built at the giant shipyard where many of the nation's undersea craft have been built for the U.S. Navy.

Named for a Phoenician sea goddess, the submarine was built for the University of Pennsylvania which later sold it to a New York businessman, Randolph Dyer, who has been storing it at Don Taylor's service station for about 6 years.

Taylor is upset with the failure of Dyer to pay his rent, so he moved the craft outside where it now sits among the less exotic means of transportation.

While in the service of the University Museum, the ASHERAH, which was launched by a crane in May, 1964, took part in an important underseas archaeological expedition in the Aegean Sea. The search resulted in the discovery of the wreck of a Roman ship that had sunk more than 2,000 years ago off western Turkey.

Dr. George F. Bass, one of 4 men designated by the university to operate the vessel, led the search that resulted in the discovery in 1967. His search led him to a site 15 miles north of Yassi Ada (Flat Island), which is located between the mainland Turkish city of Bodrum and the Greek island of Kos.

Equipped with a stereo camera to record findings, the ASHERAH has two 500-watt floodlights for underwater systems, fathometer, gyroscope, and sonar for navigation and communication.

The submarine has a 5 foot pressure hull, weighs 8,500 pounds, and has the capacity to reach speeds of 4 knots and depths of 600'. She also has 6 viewing ports.

It was not immediately clear how much the ship is worth but it reportedly carried a $60,000 price tag in 1964.

Paul owns his very own submarine

WHEATON, Ill. — The yellow submarine moored in Paul Pearson's backyard did not miss Lake Michigan by 30 miles

And, unlike the story sung by the Beatles, Paul does not live inside the 32-foot vessel.

But the Wheaton high school student definitely owns the submarine sitting a few feet from his home.

The 15-year-old and a silent partner purchased the boat from a banker. They towed it on an old truck chassis from storage at a missile site to Pearson's backyard near downtown Wheaton.

"He is one of those guys who has one of everything, and, all of a sudden, he decided to sell it," explains Paul about the former owner.

NOT every sophomore in high school can boast about his personal submarine for two, and Paul liked the idea.

The ship itself was built by a professional engineer who welded the quarter-inch steel plate together in his spare time.

Paul says his submersible is definitely seaworthy (or lakeworthy), but he'll have to do some swabbing and battening before he takes it for his first cruise on the Great Lakes

The sub hasn't taken a dive in almost six years, although it took a surface swim in the Fox River last summer

To get the ship ready for underwater travel, Paul and a few friends will have to test the controls, enlarge the diving planes, install an electric motor, refurbish the engine and, most importantly, check the welds which hold the submarine together.

OF course, he plans a few luxuries, too — like a small sonar set, a couch in the tight quarters and hull-to-hull carpeting. The radio comes later.

"We plan to have it going by summer sometime," Paul indicated, with a nautical gleam in his eye.

Once the submarine is shipshape, a few other problems surface. The first is where to sail a submarine.

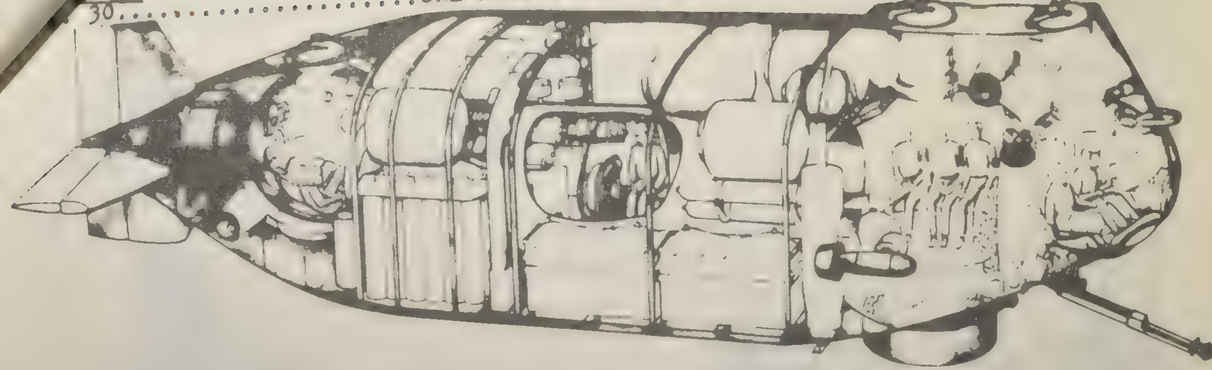
Unfortunately a U.S. treaty with Canada frowns on submarines plying the waters of the Great Lakes.

PAUL AND HIS SUB

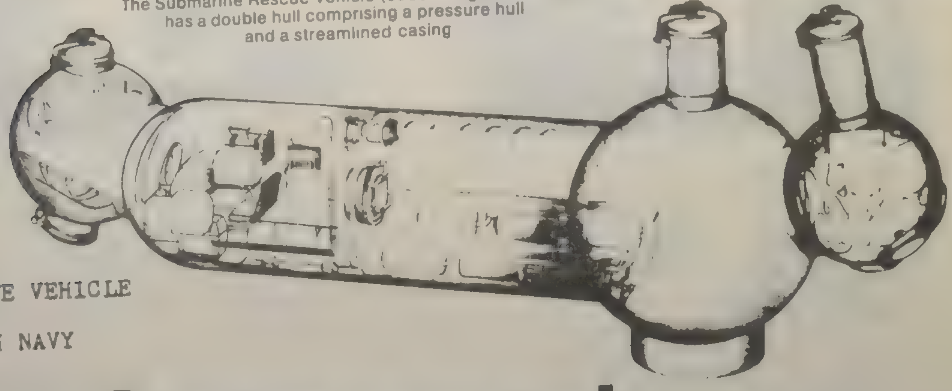
Larry Megow sent a photo of the ALVIN published in the Jan. 11th issue of the Baytown Sun. He and I are both concerned about the caption under the photo which reads, ""Mini-submarines, which carry from 2 to 5 people, will soon be advanced enough to carry several missiles that could strike at targets with remarkable accuracy. Their size makes them extremely difficult to detect at long range." Larry asks if I would request comments from the pilots and/or submersible operators on the ramifications of using our research subs for military purposes. I will publish answers and will pass on copies to the Deep Submersible Pilot's Association for use in their newsletter also.

Listing of HYCO boats and their present whereabouts.

P1, P II, P III, P VIII, P X	All at Vickers Oceanics in the U.K.
S.D.L. 1	Canadian Navy
P IV	D.O.E. Canada
P V (non-operational for a while)	HYCO Subsea, U.K.
P VI " " " " "	HYCO Subsea, Canada
AQUARIUS I	HYCO Subsea, U.S.
P VII, P XI	USSR
TAURUS I (Finished trials in Canada)	HYCO, U.S.
LEO	P&O, U.K.



The Submarine Rescue Vehicle (code designation URF) has a double hull comprising a pressure hull and a streamlined casing



SUBMARINE RESCUE VEHICLE
URF
ROYAL SWEDISH NAVY

Arrangement

Internally:

The pressure hull is sub-divided into four compartments. Reading astern these are: the Operators' Compartment, the Rescue Compartment, the Auxiliaries Compartment and the Divers' Compartment.

The URF is controlled by two men in the Operators' Compartment, which contains all controls and instruments for operating the vehicle. This compartment is fitted with an entrance hatch and a connecting door aft to the Rescue Compartment.

The Rescue Compartment can accommodate 25 persons. It is fitted with an entrance hatch, a rescue hatch and a connecting door aft to the Auxiliaries Compartment. The rescue hatch cover is hydraulically operated and is fitted with a winch and a wire rope cutter which are actuated by a hydraulic pump unit mounted forward of the hatch.

The equipment in the Auxiliaries Compartment mainly consists of electrical outfits and gas distribution panels. There is a hatch and a medicine lock in the after bulkhead.

The Divers' Compartment is fitted with an entrance hatch and in the bottom an exit hatch. The diving system is designed for use to a maximum depth of 300 meter.

Externally:

The three viewing ports of the Pilots' Compartment face obliquely downward. The sonar transducer, the manipulator and a number of spotlights are mounted on the underside of this compartment. On top of the compartment there are an eye-plate for a towing hawser and a connection box for electrical power and communication via the towing hawser.

The propulsion units are mounted on either side of the Rescue Compartment. Four thrusters facilitate lateral and vertical motions. Four separate storage battery containers are mounted aft of the propulsion units.

The URF is equipped with four ballast tanks and a compensation tank with a pump unit. List units are fitted on both sides of the Auxiliaries Compartment. The vessel is trimmed by means of two mercury units, one fore and one aft. The URF can be docked at angles of up to 45°.

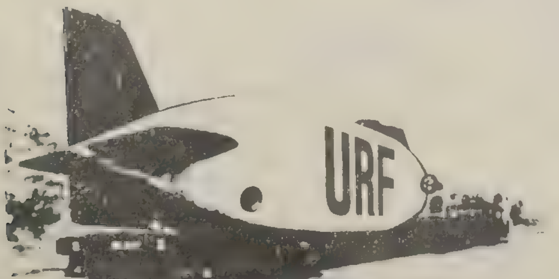
In order to compensate for the weight of a rescued crew, steel shots can be released from two containers mounted forward of the storage battery. The shots can be released in quantities corresponding to the weight of one person.

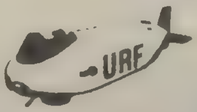
Four rudders are mounted aft of the Divers' Compartment. A navigation light and a wireless aerial are fitted on top of the upper rudder.

Rescue operation

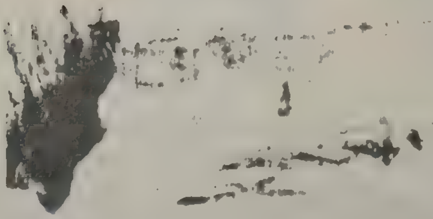
Once an alarm has been received, the URF is conveyed by trailer to an appropriate harbour to which a towing vessel has also been ordered The distressed submarine is located with the help of other vessels

The URF is towed to the place of the accident It can be towed either surfaced or submerged in the event of heavy weather While under tow the URF is supplied with electrical power from the towing vessel by means of the towing hawser

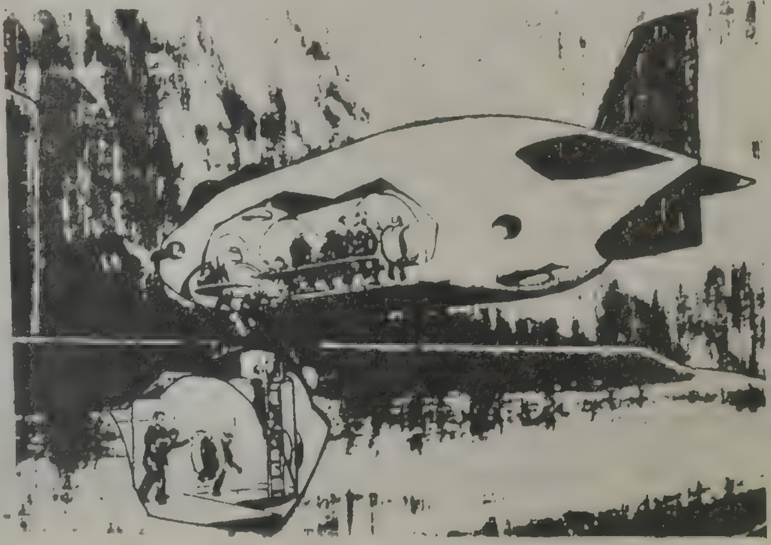




The URF is released from tow at about one nautical mile from the place of the accident It then proceeds to home in on the distressed submarine by active and passive sonar means until visual contact is established.



The manipulator is used to secure a wire rope to the rescue hatch cover of the submarine divers may assist in this operation The URF then hauls itself down onto the sub The crew of the submarine enter the URF, which then surfaces for towing back to harbour.



Data and Performance

Main Dimensions:

Length	13.5 m
Beam	4.3 m
Height	3.9 m

Hydrostatic Data:

Displacement	49 ton
Draught (surfaced)	2.9 m
Freeboard (forward entrance hatches)	0.8 m

Complement:

Operators' Compartment	2 Operators
Auxiliaries Compartment	1 Engineer
Divers' Compartment	2 Divers
Rescue Compartment	Space for 25 persons

Diving Depth:

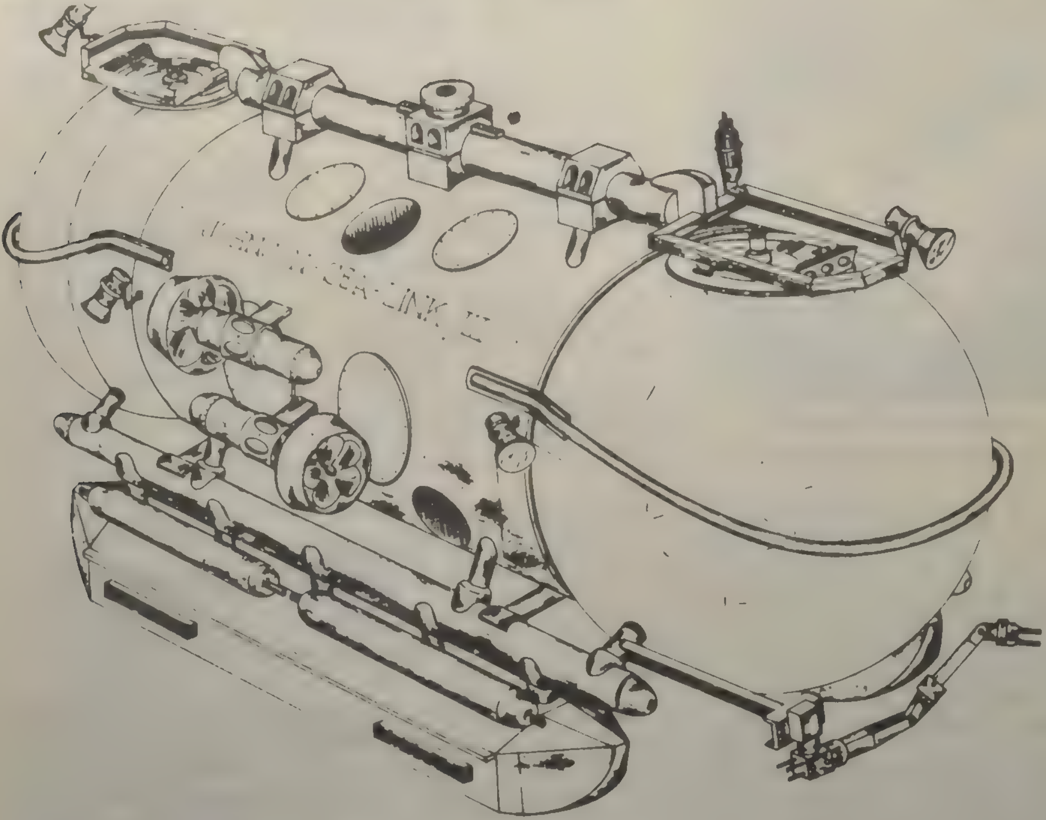
Max. depth	460 m
Max. depth for diver operations	300 m

Speed:

Max. speed ahead	3.0 knot
Max. lateral and vertical speeds	0.6 knot

Transportation

By road	60 km/h
Under tow	10 knot



A most interesting letter was received from Mr. R.W. Cook, who is operations manager for the JOHNSON SEA LINK submersibles. I will share it with you all in full.

"You may be interested to know that Harbor Branch is currently building our third submersible, JOHNSON SEA LINK III, which is scheduled for completion about the end of 1977. This submersible will not be a lockout vehicle, but will incorporate two acrylic spheres for maximum observation. (see above drawing..Editor)

A total of 7 dives, 169-175, to 1,000 feet were made in the JOHNSON SEA LINK submersible in Bahamian waters just south of Grand Bahama Island during the period from Feb. 27 to Mar. 4, 1977. (see pg. 27 of the Apr. issue for the write up on the covers received) Two observers, one in the sphere and the other in the dive compartment, reported on magnetic tape the plankton and fishes seen. The depth of the water column ranged from 200 to 800 fathoms. Each day very slow vertical descents and ascents occupied most of the three to four hour dives.

The dives, for the most part, were conducted at night with all the lights of the submersible on. A new light which Harbor Branch has developed, called a Xenon short arc light, was used and was far superior in the amount of light output as compared to our standard lights on the submarine. This new light aided us greatly in the observation of the fishes and organisms that make up the deep scattering layer."

Thank you so much, Ron. The above is all very interesting. You all may send your covers for the JOHNSON SEA LINK subs to..

..Mr. R.W. Cook, Operations Director, Harbor Branch Foundation, Inc.,
RFD 1, Box 196, Fort Pierce, FL 33450.

Britain Making First Plastic Submarines

LONDON (UPI) — British engineers have beaten the Americans and Russians in the race to build the world's first plastic mini-submarine.

For five years the submarine, which costs $850,000, has been a closely-guarded secret — even during trials in Scotland.

But now it has passed rigorous sea and depth trials and is going into production at Vickers Slingsly plant, part of the Vickers Group at Kirkby, Yorkshire.

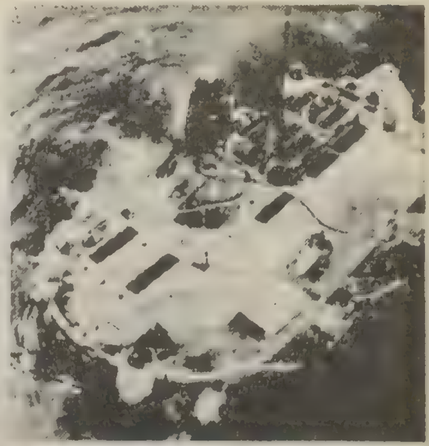
The plant makes nuclear submarines.

The 21-foot-long submarine is the brainchild of a former aerospace engineer, Jim Tucker.

He has headed a 30-strong design team on the five-year project which is being heralded as a breakthrough in marine technology.

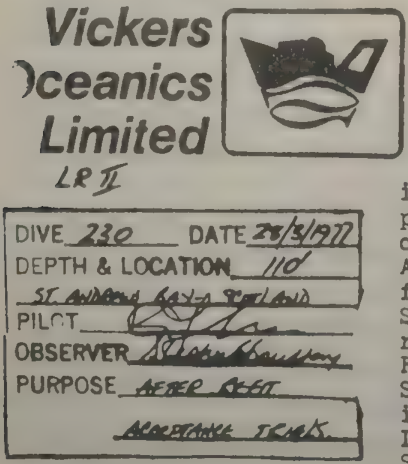
It means the three-man, rust-free submarine necessary for North Sea oil exploration and maintenance will last 10 to 15 years longer than the present metal models.

British companies have so far spent more than $13.6 million, buying 16 metal ones from American and Canadian companies.



Britain's Plastic Mini-Sub

...U.S. and Russia beaten in race — (UPI)



Vickers
Oceanics
Limited

LR II

DIVE 230 DATE 28/3/1977
DEPTH & LOCATION 110'
ST. ANDREWS BAY - SCOTLAND
PILOT
OBSERVER Stephen Boulton
PURPOSE AFTER REFIT
ACCEPTANCE TRIALS.

The above news article appeared here in the Tampa paper. I have no idea if this sub has ever had any dives documented on covers for us. However, I do remember that Steve Boulton wrote one time that the L II, renamed LR II, was a closely guarded secret whose details would be revealed in time. I would be much interested to know if the LR II is indeed the plastic sub written about above. Could you now clue us in, please Steve.

Anyhow, another cover was received from the LR II for dive #230 on 3-28-77 at St. Andrews Bay, Scotland. This was for acceptance trials after refit.

For other write-ups on the LR II see pg. 76, Sept. 1975; pg. 4, Feb. 1976; pg. 96, Nov. 1976 issues of the ONE HALF FATHOM.

LR II is NOT a lockout sub.

Stephen writes that other covers will be forthcoming for further L III trials, L IV diver lockout sub, and PISCES I after refit, to be renamed T 2. You may send covers with British postage to...Mr. Stephen B. Boulton, Vickers Oceanics Ltd., Cavendish Park, P.O. Box 8, Barrow-In-Furness, Lancashire, LA14 1AD, England.

The newest Soviet submersible is a 3 man sub named the OSA-3-600. It was designed by the Moscow branch of the Giprorybflot Research and Design Institute of the USSR Ministry of Fisheries for use by the National Research of Sea Fisheries and Oceanography. The vessel has a speed of 3 knots and is capable of reaching 600' depths. The systems were successfully tested in the Black and Baltic Seas. (from DSPA newsletter).

Mr. C. Caillart of GENAVIR, a subsidiary of CNEXO in Paris, reports that CYANA made 82 dives during 1976. CYANA is being refitted and overhauled and will proceed to normal operational activity in April 1977. At the end of 1977 there is a plan to change her exostructure to a titanium frame, and the general shape will be completely transformed. The last address I had for CYANA was...Chef de la Section des Engins de CNEXO, Base Oceanologique de Mediterrannee, ZI Toulon Est, 83130, La Garde, France. No luck though since the FAMOUS expedition. (from Submersible Soundings)

SUBMERSIBLE SOUNDINGS

A Newsletter of the MTS Professional Committee on Undersea Vehicles

Submersible Soundings co-editor Michael Mulcahy, who is also associate editor of Sea Technology Magazine, wrote an article for the February 1977 issue of the magazine updating the worldwide status (level of activity) of submersibles, with the self-explanatory title of "Manned Submersibles: Still In Demand Despite Offshore Slowdown." He concludes that the lessons learned in North Sea operations will apply when the U.S. east coast is developed by petroleum interests. These lessons include the restrictions placed on operation by rough weather and deep, cold water. The article appears on pages 10-14 of the magazine, available for $1.25 plus postage from Compass Publications, Inc., 1117 N. 19th Street, (Suite 1000), N. Arlington, VA 22209. The issue is Volume 18, No. 2.

ON THE SUBJECT OF SUBCOMMITTEES - USVC subcommittees on UNMANNED VEHICLES and HABITATS are still in their formative stages. PLEASE CONTACT Ivor Lemaire or Sam Kelly (UNMANNED VEHICLES) and/or David Adkins (HABITATS) before the OTC meeting if you are interested in affiliating with them to help firm-up these subcommittees as well as the overall USVC organization. Ivor's address is given above. Dave's address is: David E. Adkins, Program Director-Ocean Research and Eng., Battelle's Columbus Division, 505 King Avenue, Columbus, Ohio 43201, (614) 424-7866.

J. Vadus and F. Busby are Candidates for MTS Offices - Included in the slate for the 1977 election of officers at MTS are: Joe Vadus running for the Office of Director-at-Large; and Frank Busby running for the Office of Director of Public Affairs.

Report from B. Lachmann of Kockums - Committee member Bengt Lachmann left the Naval Division of Kockums, Malmo, Sweden, on April 1 to become Director General for the European Oceanic Association in Monaco. Called Eurocean, the organization is comprised of industrial companies and banks. A major task of the group is to catalyze the creation of new ideas for developing projects presenting future business opportunities for its members.

The Eurocean program consists of action in the fields of energy from the oceans; offshore minerals; living resources; biochemicals from the sea; artificial and floating islands; recreation; pollution control; remote sensing; technology assessment and coastal zone management.

Before leaving Kockums, Lachmann reported that the Kockums program for autonomous submarines is taking shape. Symposia were held in Aberdeen and London for oil companies working in the North Sea. There was a generally favorable reaction to the presentation at these meetings of the Kockums 500-ton diver lockout and the 600-ton general purpose submarines.

AN UNDERSEA SCIENCE SUBCOMMITTEE- Chairman Joe Vadus of the Undersea Vehicles Committee has received a request to explore with Committee members the possibility of creating an Undersea Science Subcommittee of USVC. An Undersea Science Group now exists headed by Drs. Bob Given and Andy Pilmanis of the Catalina Marine Science Center. The establishment of the proposed subcommittee, if approved, would add a substantial group of submersible users. This matter will be raised at the OTC meeting.

Safety Standards for Undersea Vehicles - John Pritzlaff of Westinghouse reports that the project to develop a set of "Recommended Safety Standards For The Operation Of Undersea Vehicles" is progressing on schedule. Three major categories are being addressed: Personnel; Plans & Procedures; and Equipment. Working groups have been formed from activities that operate 2 or more submersibles or have significant operating experience. Each working group has five members and two observers.

Personnel: Members from: WHOI, COMEX, Subsea Oil, IUC, Canadian Navy; and observers from American Bureau of Shipping and Travelers Insurance Co.

Plans and Procedures: Members from: Vickers Oceanics, General Oceanographics, HYCO, CNEXO, Harbor Branch Foundation; and observers from Lloyd's Register of Shipping, and Undersea Projects Insurance.

Equipment: Members from: Perry Oceanographics, U.S. Navy Sub Dev Group I, Intersub, P&O Subsea, Horton Maritime; and observers from Det Norske Veritas, and Searle Consultants.

Rough weather diving system

Installation of a diving bell inside a semi-submersible or ship below the waterline reduces forces caused by wave action at the air/water interface

One of the major problems facing North Sea divers is bad weather. While this may not be felt far below the surface, wind and wave conditions often prevent entry and return from the water. Now, a new method of launching and retrieving divers, without regard to weather, has been introduced which uses underwater equipment that insures diving bells do not pass through the air/water interface at all.

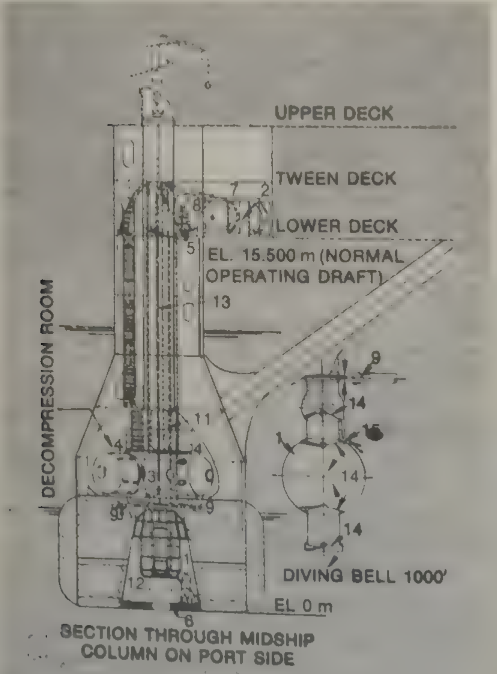


Fig. 1. The diving system would be built into one of the columns of a semi-submersible The well could be serviced with the cranes onboard the rig The drawing shows the location of the following equipment (1) 1,000-ft diving bell (2) hydraulic winch for diving bell (3) entrance chamber (wet pot) rated at 30 bars (4) living chamber rated at 30 bars (5) guideline winch (6) diving bell guide weight (7) storage box for 1,000-ft umbilical (8) umbilical winch (9) hydraulic clamps (11) emergency transport chamber (12) docking compartment (13) inner cylinder, well housing (14) hatches, and (15) valve.

The new system comes from Norwegian engineer Thor Haavie, now with Houlder Offshore Ltd. in London. Development is shared by Haavie's own firm in Oslo, Submarine Engineering A/S, and the Aker Group company Shipping Research Services (SRS). SRS holds the Norwegian patent, while Haavie's firm covers the rest of the world.

The idea originated in 1971, with patent applications starting two years later. Further development has taken place over the past 18 months, and Haavie tells *Ocean Industry* that U.S. patents have now been taken out. Next step, he says, will be a major marketing thrust.

Known as Subsurface Diving Gear (SDG), the system is based on a link between a diving bell and an entrance chamber under sheltered conditions. The basic idea and most important advantage is that the bell is surrounded by water at all times. It never breaks the water surface and this prevents the effects of slamming. At the depth where docking is carried out, wave motions are considerably reduced. At a 15-m depth, reductions of wave particle velocities range from 80 percent in a Force 4 sea state to 50 percent in Force 8.

Thus motion in Force 8 is similar to motion at the surface in Force 3. In addition, there is no slamming. While ship motion will be greater in more severe sea states, vessels used for diving support must have good motion characteristics in any case. For instance, a semi-submersible support vessel of the *Aker H-3* type has a maximum heave acceleration of only 0.06 g in Force 8. Finally, the surrounding water has a damping effect on the bell, while there is virtually no movement in the docking chamber itself.

Moonpool comparison. Experience in handling a bell through a moonpool suggests that this solution is not adequate for advanced diving. Also, for even moderate sea states, it has been shown to give insufficient security for the bell. In fact, it can make conditions worse due to the resonance that occurs in certain sea states. For a stationary cylindrical moonpool, absolute resonance is doubled compared to maximum wave height. Compared to average wave height, the motion is heightened by four times or more.

Within drafts of 5-15 m, resonance occurs at sea states from Force 3 to Force 6, a very important operating range. For small drafts, resonance occurs even in moderate sea states. For greater drafts, resonance has more effect due to the increase in wave energy and the greater stability of the ship which leads to bigger relative movement in the moonpool.

Semi-submersible installation. Fig. 1 shows how SDG would be installed in a semi-submersible. The entrance chamber and all decompression chambers are housed on the pontoon top inside one of the central columns. A connecting trunk runs through the pontoon, ending in a flange inside the upper part of a docking chamber. This consists of two cones and a watertight section of the pontoon. A cover, formed by the bell guide weight, provides a seal over the entrance when the platform is on the move. This serves as a floor for maintenance purposes and can be reached via an access sluice.

A control room is arranged 2.8 m above the pontoon bottom. Visual contact with the docking chamber is provided by port holes. The divers' change room is on the same level. These rooms are at atmospheric pressure. A gas-tight hatch leads to the access sluice. Stairs lead to the pontoon deck level where three decompression chambers are arranged around the entrance chamber.

Equipment can be passed up and down the column via hatches. Flange connections on top and at the side of the entrance chamber allow for the hook-up of emergency transport chambers. These can be lifted direct to the platform deck for onward transport to shore or to link up with a hospital decompression chamber, if carried on board. The access cylinder is sealed during normal operations.

A winch room and an umbilical room are housed on the platform's lower deck. The former contains two winches for the bell, the latter one for the umbilical. Living quarters are arranged next to the umbilical room.

Another layout has been designed for use on board a crane ship (see Fig. 2). Operationally, it is desirable to install diving equipment in the forward part of the ship. In this case the crane is also installed there and the bow provides a strengthened area suitable for SDG installation. Ample space exists below the main deck to house all the equipment needed. Minimum draft of such a ship is about 9 m, again ideal for location of the docking compartment well below wave action.

DIVING SUPPORT SHIP DELIVERED. The *M/V Talisman*, diving support and underwater construction ship (model shown), was recently delivered to COMEX in Marseille. The ship will be moved to the North Sea in February where it will be owned and managed by a joint venture of Comex Services and Serra Freres. The dynamically-positioned ship will be able to support continuous saturation diving to 1,500 ft. Dimensions are: length, 97 m; breadth, 18.3 m, and draft 4.7 m. Propulsion and positioning are provided by four Schottel units with a total of 3,200 hp. The *Talisman* is also equipped with a 250-ton crane.

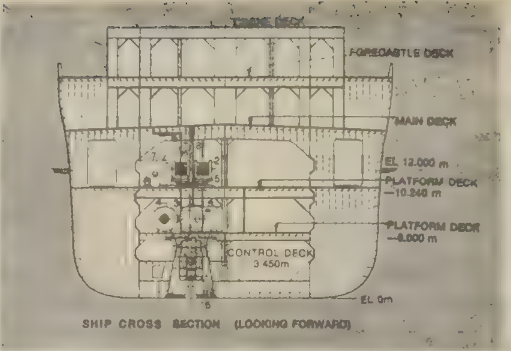


Fig. 2. System installed on a ship. The drawing illustrates the following: (1) 1,000-ft diving bell (2) hydraulic winch for diving bell (3) flooding chamber rated at 30 bars (4) living chamber rated at 30 bars (5) guideline winch (6) diving bell guide weight (7) storage box for 1,000-ft umbilical (8) umbilical winch, and (9) winch for lifting the transport chamber.

How it works. Assuming installation in a semi-submersible, a full cycle of operation would involve the following events (numbers refer to Fig. 1). The diving bell (1) is connected to the entrance chamber (5) by clamps (13). Hatches (21 & 22) inside the bell are open, while hatches (23 & 24) are closed. The bell is completely surrounded by water at the hydrostatic pressure of the docking compartment (16). The bell's guide weight is then lowered to the seabed.

Pressure within the bell (1), the entrance chamber (5), and the decompression chambers not under saturation, is now atmospheric. The decompression room is always at atmospheric pressure. Divers enter the bell through the entrance chamber and close hatches (21 & 22). Pressure inside the entrance chamber is then adjusted to approximately equal the hydrostatic pressure of the surroundings, and water is let into the upper spherical part of the bell through the valve. This controls the water level inside the top part of the bell and up to a suitable level inside the entrance chamber.

When this operation is complete and the water level stationary, disconnection takes place and the bell is lowered. When divers return to the bell, hatches (23 & 24) are closed. Pressure inside the bell is now equal to local hydrostatic pressure (Pd). The bell is retrieved and docked. The divers in the bell open valve (25), and the control personnel raise pressure to slowly evacuate water from the entrance chamber and the upper part of the bell.

Next, valve (25) is closed and pressure in the entrance chamber and upper part of the bell raised to Pd. At this point the divers can leave the bell, moving into a vacant decompression chamber, also at Pd. The whole cycle can then be started again with a fresh team of divers.

Maintenance of the bell and the entrance and docking chambers can be carried out at atmospheric pressure if the vessel's draft is not too great. However, if a semi-submersible is well down, it may be necessary to carry out maintenance under pressure. This situation would probably only arise when high-speed work was needed. Bell maintenance is best done on deck if possible. When major work is required, it can be hauled up through the trunk used for the transport modules.

ARMS exter

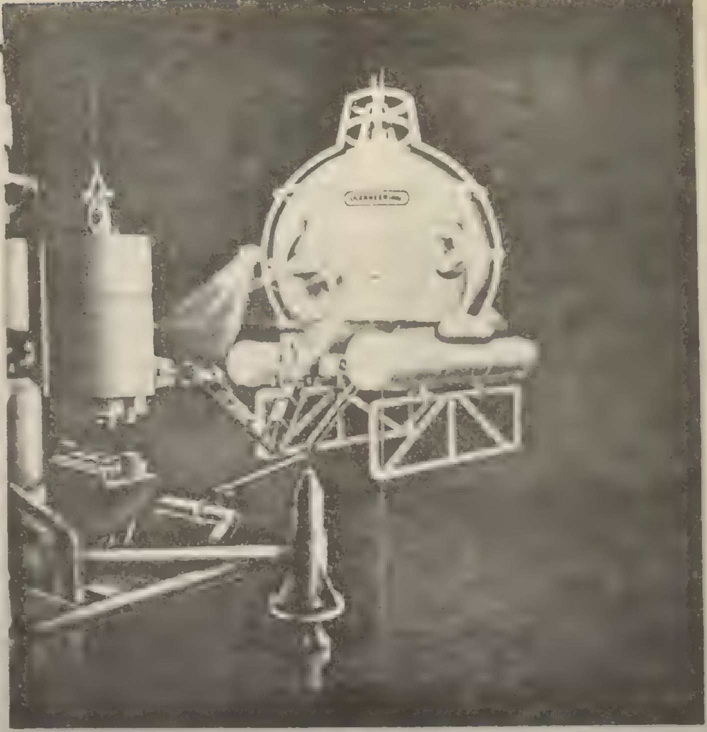
Today's offshore oil and gas industry is expanding so rapidly that in order to keep pace, commercial diving contractors are moving into high, aerospace-type technology. An indication of this technological progress is the recent use of one-atmosphere submersible work systems in the offshore oil fields. In the North Sea, for example, the number of operating one-atmosphere submersible systems, such as submarines and observation bells, has increased from five in 1973 to 23 in early 1976.

With the surge in technology the commercial diving industry has entered its second phase. Since the beginnings of offshore oilfield diving, underwater work has been performed manually by divers exposed to the surrounding water pressure. Diving systems have served essentially as elevators to transport men between the surface and the underwater work site.

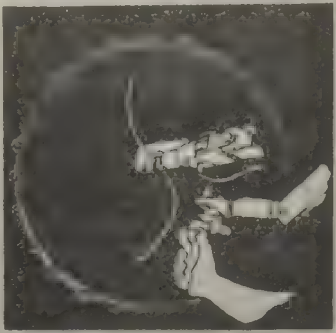
As the offshore energy search moves into ultra-deep water, however, different methods of performing underwater work are being devised. Using these new methods, men often do not even enter the water. Work is performed remotely from the surface, or from within the protective enclosure of a one-atmosphere submersible work system.

3,000-ft system

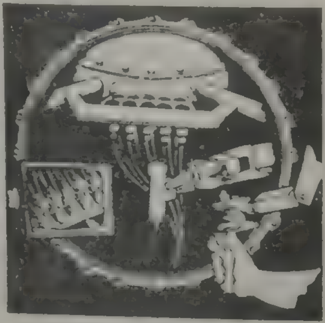
One such work system, currently being developed by Oceaneering International, Inc. of Houston, will incorporate an advanced capability force-feedback manipulator system developed by the Re-entry & Environmental Systems Division of the General Electric Co., in Philadelphia. The 3,000-ft observation/manipulator bell system, which is designated ARMS (Atmospheric Roving Manipulator System), will be the deepest rated commercial bell system ever built in the United States, according to Lad Handelman, Oceaneering's president and chief executive officer. It is to be installed aboard the drillship Pacnorse I, being constructed by Santa Fe International for the Pacific



Diving bell with outside manipulating arm moves into position at wellhead.



Inside control arm manipulates outside arm by direct movements. System gives instant feel.



Outside arm duplicates hand movements of operator inside bell in direct ratio.

ARMS . . .

Norse Drilling Co., of Norway. The drillship is scheduled for delivery next April.

Oceaneering's ARMS work system is specifically designed to provide observation and work task capability for work sites. It consists of a winch and electromechanical cable system and a one-atmosphere bell chamber which carries a two-man crew. The bell chamber is a self-contained vehicle capable of lateral movement and powered by onboard lead acid batteries.

The unique underwater manipulator consists of a master control arm located within the bell and a slave, task-performing arm mounted outside. The operator moves the master control arm which in turn activates the outside arm to duplicate his natural movements. Forces encountered by the slave arm are electrically fed back to the master arm, enabling the operator to "feel" the task being performed. By responding to this force information, the operator can comply with any interferences or restraints and can react instinctively to the work force applied at the load, even when underwater visibility is limited. No longer must he rely completely on visual feedback as with the conventional rate-controlled manipulator.

Functional design

The primary function of Oceaneering's first 3,000-ft ARMS underwater work system will be to observe and perform maintenance and repair tasks on the blowout preventer (BOP) and all ancillary subsea equipment from the Pacnorse I. The operational advantages of the system include its launch/retrieval simplicity, single cable umbilical construction and the capability to accurately position the bell around the BOP assembly. The primary advantage, however, is economy—gas costs are eliminated, the rig payload is increased because large numbers of gas bottles are not needed and the system is much lighter and smaller than a conventional diving system.

In order to carry out most effectively its observation and task performing functions, the ARMS system's submersible chamber will incorporate the simplicity and reliability of self-contained battery power and the positive positioning capability of a guide rail attachment system. The 72-in. diameter bell is lowered to the required depth on a torque balanced, armored coaxial cable which also returns communications and TV transmission to the surface. The vehicle then moves to the work site by use of the lateral thrusters.

Once at the site, it can observe from a distance or latch onto a guide rail mounted on the BOP. Once the bell is secured to the rail, it can power itself circumferentially by means of a built-in friction drive assembly. It can also travel up and down the BOP to a maximum vertical distance of approximately 80 ft, by use of the internal winch and anchor system. Since viewing, either by use of the vehicle's windows or by TV, requires conducive underwater visibility conditions, the unit has been designed to maintain position within three feet of any part on the outside surface of the BOP.

By adjusting the weight of the anchor clump, the requirement for a variable ballast system is eliminated. The unit is designed so that the inherent buoyancy of the hull and all outboard equipment render the total unit approximately 250 lb negatively buoyant with an 800-lb anchor clump. This amount of negative buoyancy is required to obtain a descent rate of 100 ft/min.

Once the 800-lb anchor clump is detached from the bell and attached to the rail or set on the sea floor, the unit becomes 550 lb buoyant. The unit can then be winched up or down.

For general observation tasks in clear water or work requiring accurate vertical positioning (ie., replacement of sonar beacons or retrieval of items which are not within reach of the rail) the bottom-anchoring method of operation is most practical.

Hull configuration

The Oceaneering ARMS system's pressure hull consists of a 72-in. diameter spherical shell, made from 11/16-in. thick, A537, Grade 2 steel. The main observation window is a 120° spherical sector, 3 in. thick, with an aperture of over 25 in.

In addition, there are four side, top and rear conical viewports with 6-in. apertures. Each viewport can be fitted with a special "side-angle" plexiglas lens for missions where more viewing area is needed. They can also be interchanged with steel plates if more penetrations are required for the installation of special tools or additional instrumentation. The hull's entry hatch is 19 in. in diameter.

Equipment

The system's exterior equipment includes a self-contained hydraulic downhaul anchor winch system, two hydraulic lateral thrusters, the hydraulic lock/traverse mechanism, the main electrohydraulic power system, a manual hydraulic system, exterior lighting and two pressure-compensated battery pods with removable battery trays. A second set of charged battery pods is kept on board the surface vessel ready for installation at any time. Estimated battery change-out time is less than one hour.

In addition to the back-up battery system, the ARMS' interior equipment includes a 240 man-hour life support system, an emergency mask breathing system, main and back-up hydraulic system controls, instrument/equipment controls, hard wire and wireless communications and a sonar system.

Launch and retrieval

The ARMS deck handling system consists of three components—the launch/retrieval winch, the umbilical cable and the alignment frame. The winch has a maximum load rating of 35,000 lb and a maximum retrieval rate of 150 ft/min. It also has a complete separate hydraulic power system which can operate off ship emergency power to retrieve the bell at maximum line pull but lower-than-maximum rate.

The umbilical is 3,500 ft of 1.2-in. electromechanical cable. In addition to functioning as a load line for the ARMS system, this umbilical also includes the co-axial communications and TV cables.

The alignment frame guides the bell through the moon pool. Lateral alignment is maintained by the funnel-type frame, and the bell is rotated underwater with the thrusters.

Positioning system

Depending on the work task to be performed, the bell can be positioned at the work site by means of either a BOP attachment system or a bottom anchoring system. In situations where the bell is to be attached to the BOP, an anchor traverse mechanism "grabs" a track which is permanently attached to the BOP stack. This trav-

ARMS . . .

erse mechanism functions as a wheeled trolley to move the bell circumferentially around the stack.

For operations where the bottom anchoring method is more practical, a passive anchor "clump" is substituted for the traverse mechansim. This clump is lowered to the sea floor and the bell can be winched up and down to achieve proper vertical positioning.

Manipulator system

The underwater single-arm manipulator system designed by the Re-entry & Environmental Systems Division of the General Electric Co. for use in the Oceaneering 3,000-ft ARMS work system will be the first known commercial force-feedback manipulator ever to be used underwater.

This underwater manipulator system is based on years of GE experience gained from its Man-Mate industrial manipulators currently in use in forging operations, foundries and manufacturing facilities throughout America, Japan and Europe.

The hydraulically powered force-feedback manipulator system has been described as a "man-amplifier." That is, it provides performance analogous to a man's but magnified in strength and reach. It allows complex tasks to be performed in a mechanized manner but with the unique capabilities of man's senses and judgment.

Most conventional underwater manipulators are of the rate-feed variety. The arm and hand movements are accomplished via proportional speed regulators, and the other functions are controlled with on/off switches by the operator. These manipulators can perform only one movement at a time and they provide no sense of feel. The force-feedback manipulator, on the other hand, can perform all motions simultaneously. Each motion need not be performed in a series.

Master-slave

GE's underwater manipulator is in a master-slave configuration The operator provides the guiding control with the master arm, which is located inside the Oceaneering bell. The slave or task-performing arm outside the bell, mimics the motion of the master. The hydraulically powered rotary actuators are arranged at each joint to simulate the human arm, with two wrist motions and a forearm rotation mutually orthogonal, an elbow joint and two shoulder motions, elevation and azimuth. The electrically powered master is a small replica of the slave, with a hand grip at its terminus.

The key elements of this system are spatial correspondence and force feedback. The accurate and responsive spatial correspondence of the slave motion, or position, to the master provides precise control. This precise control readily allows the operator to effectively direct the magnified machine motions without fatigue. He does not have to constantly attempt to compensate for overtravel or position error.

Force feedback

As the operator moves the terminus of the master, the slave follows at a one-to-one ratio in speed and displacement. As a force or an object is encountered by the slave, a portion of the torque generated in a joint is fed back to the master to produce a proportional torque in the corresponding master joint. Thus the operator can sense acceleration and deceleration and other forces applied to the system in task performance and greatly improve his manipulative dexterity.

He no longer has to rely on the thought/decision making process required to control a rate-type manipulator. He observes the direction he wishes the slave to move and moves the master in that direction, instinctively stopping at the right position as he observes the slave.

Under certain conditions the operator need not rely completely on visual feedback. With the compliance present in this bilateral system he can perform tasks in much less time in fields of poor visibility. His hand, while operating the machine, can sense changes and react to them in a normal, instinctive manner. Tests have shown that some operations can be performed at zero visibility, relying only on the operator's sense of feel. The advantages offered by the force-feedback manipulator system at low and zero visibility could be compared with the enhancement of sense of feel resulting from human blindness.

The force feedback also provides a valuable compliance feature for handling high inertia loads. For example, the slave arm can be used to snub the motion of the bell as it moves past a stationary object because the arm will "comply" with relative motion and even let go if the forces on it increase to excessive levels, much as a man would react in a similar situation.

Ease and flexibility

In addition to the elements of spatial correspondence and force feedback, other features of the GE manipulator include application flexibility, ease of operation and minimal operator training. The manipulator is sized to handle a 65-lb load at full rated speeds, with a "stall" capacity of 100 lb. The six-degree-of-freedom slave has a 5.5-ft full extension to the ends of the universal stub fingers, which are designed for quick interchange with all tooling. The hand grip provides a seventh motion.

Equipped with tools much like those normally used by divers, the manipulator can perform many of the tasks currently performed by divers, and complete them in comparable time periods. All power and control components are enclosed in the modular structure, which is protected by a pressure compensated oil system. The modular unit can be easily disassembled for routine maintenance.

The agreement between Oceaneering and General Electric to develop the deepwater observation/manipulator work system advances Oceaneering further into the age of sophisticated man-machine systems in the commercial diving industry. Extending man's capability by combining a force-feedback manipulator with a one-atmosphere vehicle is expected to provide the capability to perform complex underwater tasks that might otherwise be impossible because of existing equipment limitations and diving depth restrictions.

An oil company official has remarked that by 1980, economics rather than technological factors will govern the depths at which underwater operations are feasible. Developments such as the ARMS 3,000-ft bell system are furthering underwater work capabilities and proving the validity of this prediction. The technology is available. And the combined, concerted efforts of such companies as Oceaneering and GE are also helping prove that high technology can also be economical. □

Reprinted from the May 1976 edition of OFFSHORE

Copyright 1976 by the Petroleum Publishing Company

Diving bell with force-feedback manipulator might get 1st contract

Oceaneering International is negotiating with Pacnorse Drilling Corp. to place Oceaneering's Atmospheric Roving Manipulator System (ARMS) on the drillship *Pacnorse I* instead of the usual diving complex

ARMS uses a force-feedback manipulator to perform tasks on subsea equipment to depths of 3,000 ft. The system was developed by Oceaneering. The Re-entry & Environmental Systems Division of General Electric Co. developed and built the force-feedback manipulator while Perry Oceanographics built the diving bell

Pacnorse Drilling Corp. is a joint venture of Santa Fe International Services and Pacific Norse Shipping Ltd

Manipulator is the key. Oceaneering and General Electric's Re-entry and Environmental Systems Division held a demonstration of ARMS at a Shell Research facility in Houston. The force-feedback manipulator was used to perform several tasks in a wet tank

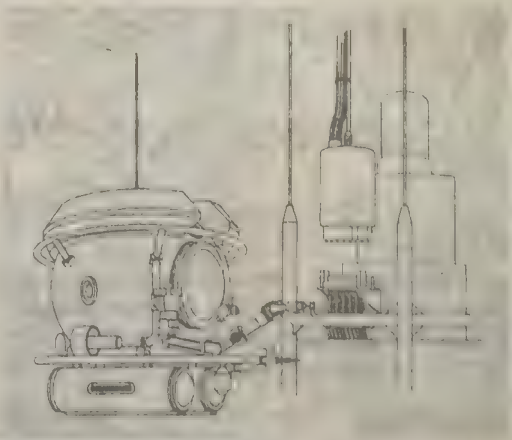
Once out of the tank, one of the GE employees showed us how easy the manipulator was to use and just what delicate operations the unit could perform. Using a trowel, the manipulator cut a slice of cake, placed the slice on a tray and handed it to one of the spectators

The manipulator can handle a 65-lb payload and has a full extension from the bell of 5.5 ft. The hydraulically powered manipulator has six planes of motion plus grip. There are three wrist motions—yaw, pitch and rotate—and mutually orthogonal elbow motion as well as two shoulder motions—shoulder azimuth and flex (or pitch)

The manipulator follows a 1:1 ratio in angular displacement and a 3:1 ratio in linear displacement. In poor visibility or strong currents, the ARMS manipulator can start nuts, stab guidewires, turn valve handles, locate and feel gaps, and grasp and perform tasks with pins, cables or other hardware. (*Ocean Industry*, April 1976, page 369)

Diving bell equipment. Perry Oceanographics built the 72-in diameter diving bell. The company also provided a second standard manipulator which is used to anchor the submersible while performing operations with the force-feedback manipulator.

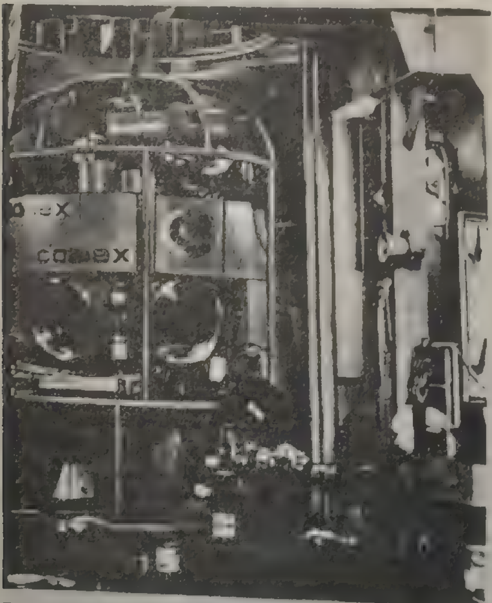
The system is powered by onboard lead-acid batteries carried in pods under the bell. A 25-in. main observation window allows the two-man crew to view the work area. Top and side view ports are used by the operator to position ARMS. More than 1,000 watts of lighting power is provided



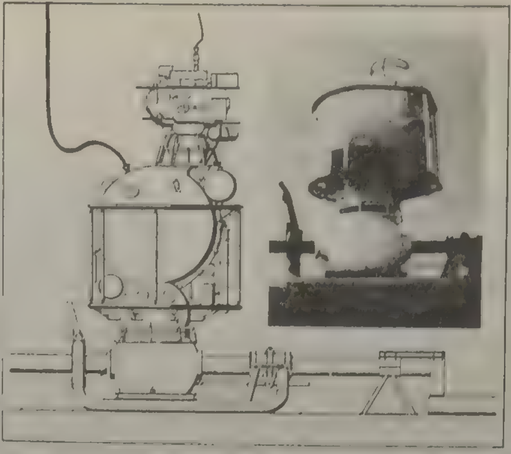
ATMOSPHERIC ROVING MANIPULATOR SYSTEM changes a hydraulic connector on a BOP stack

Sonar can be used as a navigational aid in poor visibility. Two hydraulic, variable speed thrusters can rotate the bell

The deck handling system includes: a launch/retrieval winch with a maximum line pull of 35,000 lbs and maximum retrieval rate of 150 ft/min.; 4,000-ft umbilical cable, and funnel-shaped alignment frame for the mothership's moonpool.



Two new diving bells (one is shown above)—*MOB 1001* and *MOB 1002*—were built by Comex with a 1 000-m depth capability The units are working for CFP and Getty Oil Subsea welding chamber, photograph inset above right is part of the Weldap system (shown in the drawing) tested by Comex in 20 m of water The system is designed for one-atmosphere welding to 300 m depths The lower chamber is fitted over the pipe and special seals allow the chamber to be pumped dry and kept at one atmosphere pressure The larger chamber is lowered next and fitted to the first chamber Weldors are transferred to the combined chambers by a personnel transfer capsule The unmanned submersible *Telenaute*, right was originally built by IFP Comex redesigned the submersible and renamed it the *TOM 300*



MAR. 1977............

Crane Cable Snaps, Diving Bell Sinks

MARSEILLE, France (AP) — A crane cable snapped yesterday, sending a diving bell with three men inside 75 feet to the bottom of a cove in Marseille harbor.

The diving bell was retrieved by the crane, assisted by frogmen, two hours later. Two of the men inside were unharmed and the third was hospitalized with slight injuries, officials said.

UK Firm Introduces Underwater 'Toboggan'

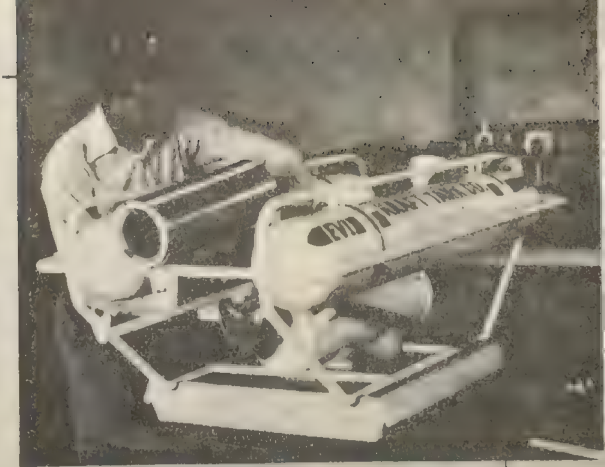
Belldeck Ltd., England, has introduced an underwater "toboggan" for carrying divers and their equipment to the seabed. The new device is called an Aquabatic and has commercial, scientific and military applications. The diver, wearing a wet suit and breathing apparatus, lies on the Aquabatic as on a toboggan and maneuvers it with foot controls.

Made of fiberglass, the vehicle can carry instrumentation ranging from a simple compass to direction-finding equipment; it can be fitted out with such items as extra air tanks, camera and lighting equipment. The craft is propelled at 3 m.p.h. by an electric motor. It is free flooding so there is no pressure build-up and is designed to operate at depths of 150 ft. of water, but can go much deeper with modified sealing.

Semisubmersible Ship Feasibility Studies Offered By Calif. Firm

Stable Ship Development Company, San Diego, Calif., is offering to perform feasibility and conceptual design studies for commercial applications of a new type of ship, designed by Dr. Thomas G. Lang of the Naval Undersea Center, San Diego (See ST. August, 1976, p. 14). The design holds U.S. patent no. 3623444.

Charles B. Bishop, president of Stable Ship Development Company, reports that the new type of high-speed semisubmerged ship has shown greatly improved stability and seakeeping qualities at high speeds in rough seas. Potential commercial uses for the ship include passenger/vehicle ferries, fishing boats and offshore ferries.



SURFACE CONTROLLED SUBMERSIBLE, EV-1, developed by the Ocean System Division of Kraft Tank Co., Kansas City, Mo., can reportedly carry out any task performed by a non-articulated manipulator. Consisting of a 1,500 ft main umbilical tether, current deflection weight and control console, the 235-lb unit can be propelled in any direction by three reversible hydraulic thrusters. Maximum forward speed is two knots. A fixed TV camera mounted high on the forward part of the submersible's frame provides viewing of both the manipulator and sea bottom on one of the control console's monitors. The other monitor displays information concerning the vehicle's depth, heading, hydraulic system temperature, etc. Dimensions for the unit are: length, 4 ft, 4 in.; beam, 2 ft, 8 in., and height 2 ft.

NRL Develops Radar Detectable Seamarker

Scientists at the Naval Research Laboratory (NRL) here have come up with a technique to mark the ocean surface with monomolecular films and dyes. The resultant two-component sea marker can be detected visually and by airborne remote sensing divices.

Monomolecular films of surface-active chemicals damp capillary waves on a body of water and can be used to make marks that are detectable by radar day or night. The area of damped waves is also visible to the naked eye, even though the single-molecule-thick film itself is too thin to be seen.

However, since the film is so thin, a very small amount of it can be used to cover a large area on the sea surface

WETSALL Receives U.S. Navy Approval

WETSALL®, a protective coating system that can be applied over damp, rusty metal surfaces to halt rust, has been approved by the U.S. Navy for shipboard use.

WETSALL is manufactured by Farboil Company, 8200 Fischer Road, Baltimore, Md. 21222. It has been approved as an alternative to epoxy and other anticorrosive coating systems in damp areas and spaces and difficult-to-clean areas such as voids.

WETSALL penetrates rust and moisture, and forms a chemical and mechanical bond directly with the steel to develop a tough, anticorrosive film that stops further rusting. It supplements surface cleaning with hand or power tools by penetrating the rust embedded in small pits and hard-to-reach areas so completely that the rust becomes an integral part of the coating. Primer may then be applied even if the surface is saturated with moisture.

Ocean's Hot Springs

By CLIFF SMITH

Science Writer, The San Diego Union

Probing a hot spring on the ocean floor off Baja California for clues to the history of the earth, its atmosphere and the solar system is an upcoming goal of scientists at Scripps Institution of Oceanography.

The Scripps research ship Melville will leave San Diego on May 29 for a spot about 100 miles southeast of the tip of Baja California to look for hydrothermal plumes welling up out of a great cleft in the earth's crust.

The cleft, called the East Pacific Rise, is a center of seafloor spreading — a rift where molten basalt rock is coming up out of the earth's mantle to solidify and spread east and west away from the fissure.

The fissure in the rise also is spewing out hot water, presumably seawater which has trickled down through the broken earth crust, been heated and then come up again, saturated with metals and dissolved gases.

One gas of particular interest is helium 3, a rare form of the element which is 10 times more abundant in the spring water than in the earth's atmosphere.

Scripps scientists have established from probing major earth fissures and volcanoes that the helium 3-rich concentrations amount to a "signature" of the earth's mantle, the 3,000-mile-thick layer of basalt between the earth's molten outer core and the crust.

This discovery provides a means to study the earth and its history and possibly the solar system as well.

This is the case because of sharp differences in the concentrations of helium 3 in the earth's interior, in the atmosphere and in the sun's radiation flux.

Dr. John Lupton of Scripps, who will be a scientist on the expedition, explained that there is one helium 3 atom for every 30,000 atoms of ordinary helium 4 streaming away from the sun, a comparatively rich mixture.

In the earth's atmosphere, he said, one finds only one helium 3 atom for every million atoms of ordinary helium. The scarcity of helium 3 relative to helium 4 is theoretically explained by the large amount of helium 4 produced in the granitic continental crust by radioactive decay of uranium and thorium.

Helium 3 also escapes more rapidly from the atmosphere into space than does helium 4 because of its lower mass.

Looking at the helium 3 to 4 ratio in the ocean floor fountains, however, one finds it to be one in 100,000.

Thus, the helium 3-rich concentrations observed in the seafloor springs as well as geothermal emanations elsewhere on earth are thought to be newly released "primordial helium" from the mantle, which probably represents the original helium incorporated in the earth's interior when the earth formed.

"So, by studying these plumes we may be able to answer many questions about the history of the earth's atmosphere — such as the question of how much helium has been lost — as well as questions about how the earth fits into the rest of the solar system," Lupton explained.

Gases in the springs also reveal much about the makeup of the mantle rocks.

The Scripps scientists will investigate the Baja spring with a kind of tethered robot. Viewing the fissure with the submersible's cameras, the scientists can expect to find a glistening array of mineral deposits and a strange menagerie of living creatures.

Such was the case during a recently concluded series of research submarine dives to a similar undersea rift 400 miles west of Ecuador.

Arriving at the cleft, the investigators saw shiny pillow lava freshly squeezed up out of the fissure together with red, orange, white and gold-colored deposits of metal ores and other minerals.

Even more impressive was a diverse assortment of animals thriving about the fissure, apparently to benefit from its warmth, nearly two miles beneath the ocean surface.

Among the creatures seen were blue-eyed fish up to four feet long, clams with shells one foot wide, yellow crabs, pink shrimp, sea anemones and worms an inch thick and 18 inches long.

This Jules Verne adventure, which involved several U.S. institutions, really began nearly a year ago when Scripps launched its Pleiades Expedition, named for the seven godesses in Greek mythology who were transformed into a group of stars that lie in the constellation Taurus. The rising in the spring and the setting in the fall of these stars marked the beginning and the end of the navigational year, which spanned the duration of the expedition.

It was during the expedition that Scripps scientists discovered 10 hydrothermal springs flowing up out of the Galapagos Rift, an east-west crack where lava is being extruded up to form new seafloor material.

The eruptions of warm water that flow out of such zones are believed to account for the metallic deposits laid down around the fissures and frequently found in drilling probes at the base of seafloor sediments elsewhere in the oceans.

Many scientists now believe that the minerals are leached out of the broken rocks in such zones by the hot water and then are dropped out of solution when the hot water comes into contact with the near-freezing ocean water.

Then, the mineral deposits are slowly carried away on the moving seafloor to be covered with sediments over eons of time.

A number of geologists believe this kind of mineral deposition is the first step in the formation of metallic ore deposits. Eventually, they explain, the veins of ore may be heaved up out of the sea to emerge in mountain chains, as in the Andes, or in other land formations.

In the Pleiades hunt, the discovery vehicle was the Deep Tow, a highly sophisticated instrument designed and built by Scripps's Marine Physical Laboratory on Point Loma.

The device carried cameras, lights, sonar equipment, a magnetometer, and instruments that measured water conductivity, temperature, pressure and light transmission, and captured water with an array of bottles that could be opened and closed on signal.

Similarly sophisticated systems for the three-man submersible Alvin, used in the Galapagos Rift search, were designed and built by the Geochemical Ocean Section Study (Geosecs) Operations Group engineers at Scripps.

The method used to prove the existence of hydrothermal plumes on the seafloor was conceived by Dr. Harmon Craig, head of the "isotope laboratory" at Scripps. The method is based on studies of helium isotope ratios in oceanic rocks and geothermal emanations carried out by Craig and his associates, Lupton and Ray Weiss.

Although the existence of such springs had been proposed by many investigators, based on theoretical heat-flow models, no actual emanations had ever been detected unequivocally or sampled.

NAME: SCARAB - Submersible Craft Assisting Repair and Burial (Two Systems)

GENERAL DESCRIPTION: The SCARAB system is required to assist with repair and surveillance of submerged telephone cables. It will locate, unbury, attach grippers/line, cut, recover, and rebury a malfunctioning cable at depths to 6,000 ft. The entire system is completely self-contained and can operate from ships of opportunity. It can be transported by standard air cargo aircraft and can be placed into operation in short periods of time. The system incorporates automatic launching equipment, a self-contained power source, and operator huts for complete independence from ship facilities and personnel.

DEPTH: 6,000 ft. operational; 9,000 ft. collapse.

DESIGNER/BUILDER: AMETEK, Straza Division, El Cajon, California.

OWNER/OPERATOR: Transpacific Corporation
A. T. & T., B. P. O., C. & W., C. O. T. C., F. F. P. T.

SIZE: Vehicle: 10 ft. x 6 ft. x 6 ft.

SPEED/ENDURANCE: 3.5 knots/unlimited.

PROPULSION: Six 3-phase, 2,000 VAC, 5 HP oil filled, pressure equalized electric motors with nozzle and propeller providing approximately 1,800 lbs. total thrust. Two motors port, 2 starboard, 2 vertical.

One 5 HP hydraulic lateral thruster with nozzle and propeller providing approximately 300 lbs. thrust, rotatable ± 180°.

POWER SOURCE: Two 145 KW, 480 VAC, 3 phase, diesel generators; one used as a spare.

PAYLOAD:
Vehicle with Tools: 400 lbs.
Vehicle without Tools: 1,500 lbs.
With Separate Lift Line: 50,000 lbs.

CREW: Five: Operator, Assistant Operator, observer and two deck hands for launch and recovery.

WEIGHT:	SCARAB Vehicle: 5,000 lbs. SCARAB System: 75,000 lbs.
SUPPORT SHIP:	Cable repair ship or any other suitable ship of opportunity.
AIRCRAFT LOADING:	The entire SCARAB system is carried by one DC-8 or 707 air cargo aircraft in eight standard type A-2 air cargo shipping containers approximately 10 ft. x 8 ft. x 7 ft. Two containers are utilized as the operator hut and power distribution hut on the ship of opportunity. Total shipping weight is 80,000 lbs. with the heaviest single container weighing 15,000 lbs. maximum.
MOBILIZATION:	Transport from maintenance depot (e.g. Bermuda) to any port in the world in 24 hours. Install on designated ship of opportunity in three hours.
GENERAL CAPABILITIES:	Inspection/Survey - 360° search sonar, two low light level TV cameras and one 35mm still camera for inspection and survey. Location - Sensitive magnetometer probes with computer driven situation display for buried cable location. Deburial/Reburial - 35 HP motor and pump with dredge and jet nozzles for unburying and reburying cable, respectively. Cutting - Cutting of up to 4 inch diameter armored communications cables as well as other cables and lines. Recovery - Attachment of 50,000 lb. capability lift line and gripper to cables for recovery from the surface.

At the present time, the SCARAB vehicles, developed for AT&T Long Lines for telephone cable retrieval and reburial, are in manufacturing and final assembly stages. The first system will begin operational testing in December 1976.

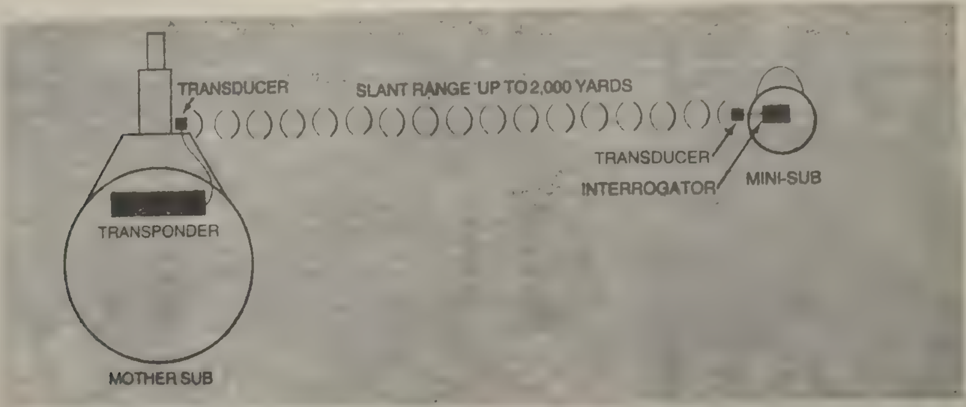
The DEEP DRONE vehicle was designed, manufactured and delivered to the U. S. Navy Supervisor of Salvage Office to aid in the rescue of stricken manned submersibles, as well as other general salvage operations, and has successfully completed its first operational assignment.

DAJ:nm

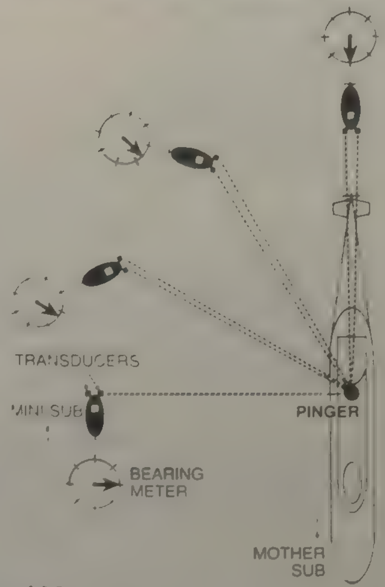
HELLE SUBMERSIBLE ACOUSTIC RANGING AND DOCKING SYSTEM

With this total system, a mini-sub is able to accurately determine the distance (up to 2,000 yards) from its mother sub and return. Once within range, the mini-sub operator picks up its bearing from an acoustic signal, and aligns itself on a course for docking with the mother sub.

SUBMERSIBLE ACOUSTIC RANGING SYSTEM: The mini-sub measures the slant range to the mother sub through an onboard interrogator which electronically calculates the time it takes a signal from the mini-sub to travel to the mother sub's transponder, and to receive the transponder's reply signal. The signal is automatically and continually monitored in ranges from 0 to 2,000 yards or from 0 to 200 yards using a 2-position switch for fine tuning.



SUBMERSIBLE ACOUSTIC DOCKING SYSTEM: The mini-sub receives pulses from the mother sub's pinger through two transducers which are aligned on the mini-sub's bow. The difference in time the signal takes to reach the transducers, due to the changing angle of the mini-sub, is automatically converted into relative bearing in degrees right or left of center. The mini-sub operator easily adjusts for drift and accurately homes in on the pinger signal by centering an arrow on the bearing display meter on board the mini-sub.



Art Lohman, of Louisville, KY, has built a one man submersible that took him 5 years and $5,000 to design, engineer, and build. Lohman hopes to build and market other models of underwater craft. The sub weighs 450 pounds and is designed to go 150' deep and 15 m.p.h.

Additions to Address List

April 1977

Bouet-Williamez, Olivier
(PC-8, PC 1201, PC 1204)
Res:
Bus: Intersub, Ltd. - L'Isnarde,
Rte de Faveyrolles,
Olioulles - 83190
France

Bradley, Vance
(PC-8. PC-1201, AMERSUB)
Res: 7476 Harrow Drive
Nashville, Tenn. 37221
Bus: Intersub, Ltd., Chateau Bovis,
Estaque Gare, 13016 Marseille,
France

deFroberville, Gerard C
(ex-ARCHIMEDES, SHELF DIVER, GRIFFON)
Res: BP 1997, Papeete, Tahiti
Polynesie Francaise
Bus: (S.O.G.E.R.E.M) Societe Generale
de Recherches et d'Exploitations
Mimeres,
16 Rue de Floncean, BP 72208
75361 Paris, France CEDEX 08

Newell, James Kirk, LCdr. USN
(TRIESTE II)
Res: 4651 Huggins Street
San Diego, Ca. 92122
(714) 453-8579
Bus: TRIESTE II, c/o SubDevGru 1
FPO San Diego, Ca.
(714) 225-7381

Olson, Richard
(NEKTON's)
Res: 9539 Genesee Avenue, D-13
San Diego, Ca. 92121
(714) 452-9540
Bus: General Oceanographics, Inc.
11578 Sorrento Valley Road, #25
San Diego, Ca. 92121
(714) 452-9540

Changes to Address List

Saxon, Ross E. LCdr USN (Ret)
(ex-TRIESTE)
Res: 1016 Country Club Drive
N. Palm Beach, Florida 33408
Bus: Sales Manager, Perry Oceanographics
P.O.BOx 10297
Riviera Beach, Fla. 33404
(305) 842-5261

Rosencrantz, Don
(ex-ASHERAH) RUWS
Res: 44-120 Bayview Haven Place,
Kaneohe, Hawaii 96744
(808) 247-5847
Bus: NUC, Kaneohe, Hawaii 96744

DEEP SUBMERSIBLE PILOTS' ASSOCIATION

NEWSLETTER

August, 1977

Vol. XI, No. 3   Published by the Deep Submersible Pilots' Assoc.

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and material in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER should be addressed to:

Robert K. R. Worthington   (714) 453-1158
Secretary & Editor, DSPA
3005 Curie Street
San Diego, Ca.   92122

Correspondence regarding new member applications should be addressed to the Membership Committee Chairman as follows:

Willis Forman   (714) 273-2967
3940 Sioux Street
San Diego, Ca.   92117

EDITORIAL NOTES AND COMMENTS

"Submersible Soundings" dated 27 June 1977 is reproduced in toto herein because of its general interest to DSPA members who did not make the OTC meeting.

Likewise, the report of the COMEX *MOANA III* accident on 30 June 1976 is included for the lessons to be learned (or relearned) therefrom.

I enjoyed an informative telephone conversation with Ron Fette on 26 May. An ex-DEEP QUEST electronics tech with extensive other diving and submersible experience since leaving Lockheed, he is now an Intersub pilot operating primarily in the North Sea. He intends to apply for DSPA membership because he feels that he's out of touch with what's going on elsewhere in the field.

An excellent series of nine free lectures entitled "Voyages Into Ocean Space" was presented in nine West Coast and Hawaii cities this summer. In San Diego, at least, attendance was phenomenal, as to be expected in this saltwater oriented town considering the subjects and the lecturers--Piccard, Schopf, Dickinson, Idyll, Rasool, Bascom, Emery, Hollick, and Craven.

DSPA REPORTS AND NOTICES

Dues - 1977 dues continue to be in arrears for the following members:

Beachler
Boggs
Boulton
Merritt
Starr
Toler
Vernon

This is the final mailing to be made unless dues are received prior to the next NEWSLETTER. Please remit '77 and '78 dues to DSPA Secretary now to avoid oversight next year! Annual dues remain at $5.00 for U.S./Canada mailing addresses and $10.00 for overseas.

OCEANS '77, the combined symposium sponsored by MTS, IEEE, and Electronic Engineers Council on Oceanic Engineering will be held in Los Angeles October 17-19. A DSPA Annual Meeting will be scheduled for Monday evening after the Undersea Vehicles session No. 12. A registration form is in the rear of this NEWSLETTER. Note the price and $15.00 saving for advance registration.

San Diego Luncheon Meeting at Tarantino's on 19 May 1977

Members Present	Non-Members Present
Bob Worthington	Skip Marquette - WHOI
Don Saner	Dick Taylor, Lt. - USS DOLPHIN
Will Forman	George Verd, LCdr. - USS DOLPHIN
Larry Shumaker	Chuck Walling - Lockheed Ocean Lab.
Jerry Shiller	George Ellis, ETCM - R/V TRIESTE
Kirk Newell	Al Smith - DEEP QUEST, L.O.L.

The highlight of the meeting was the presence of Larry Shumaker and Skip Marquette. Their account of the marvels observed during ALVIN's 26 dives northeast of the Galapagos Islands on the East Pacific Rise were fascinating indeed. Larry reported a teeming "tidepool-like" life at 9000' in the relatively warm, gas-saturated water rising from fissures and vents in the ocean floor, e.g., 9" clams, new species of fish, etc. Volcanic caverns, gaping pits, glistening lava formations made an "Alice in Wonderland" scene of scintillating splendor in some areas. From the Pacific, ALVIN returned to the Caiman Trough for six (6) dives and, thence, to the Bahamas for April-May operations before shifting to normal summer operations out of WHOI. 1977's projected dives should number 105. ALVIN will return to the Pacific in 1979.

San Diego Luncheon Meeting at Tarantino's on 9 June 1977

Members Present	Non-Members Present
Bob Worthington	Pete Severtson - Lockheed DEEP QUEST
Don Saner	Jeff Wolfe - ex-DEEP QUEST
John Cameron	
Mike Smith	
Carroll Hoyt	

Circumstances conspired to reduce attendance, but a good meeting resulted nonetheless. The Secretary reported no progress from Dick Hegeman in ascertaining the original vendor for DSPA pins so no re-order has been yet negotiated. Jim Helle is still in Aberdeen establishing his new facility. Don Saner will transfer the bulk of DSPA funds to a savings account to earn interest to help offset deficit spending incurred due to increased repro/mailing costs. Saner and Severtson reported that the DSRV fuel cell was received at LOL and is being readied for installation in DEEP QUEST for tests. Carroll Hoyt reported NEKTON's working out of Morgan City, no details available. Also, General Oceanographic's R/V SEAMARK is about to depart for the Gulf of Alaska to conduct bottom investigations in Shell drilling areas.

San Diego Luncheon Meeting at Tarantino's on 13 July 1977

Members Present	Non-Members Present
Bob Worthington	Al Smith - DEEP QUEST (Lockheed)
Don Saner	Mel Wills - TRANSQUEST (Lockheed)
John Cameron	
Will Forman	
Carroll Hoyt	

The Secretary reported progress at long last in re-ordering DSPA pins. The agent for the original procurement has been located (with Dick Hegeman's assistance), and he is in the process of obtaining a quote. Carroll Hoyt provided news of NEKTON's latest success in recovery of drilling equipment from 640' depth on Tanner Bank 90 miles west of San Diego. As our resident petroleum engineer/geologist, Hoyt rose to Will Forman's questions and discussed geologic theory in general and geological formations as related to petroleum search and exploratory drilling. Don Saner reported that the fuel cell power plant for the DSRV's is assembled in the bed for mounting in DEEP QUEST and is now on a test run in the I.O.L. parking lot. Will Forman stated that he has an application for DSPA membership from the C.O. of NR-1 but is in a quandry about processing it since NR-1's operations are all classified, making it infeasible for the applicant to properly document his application. Consensus of DSPA members present is that if his operational superior will certify that NR-1 is not a combatant submersible and that the applicant's performance exceeds the requirements for membership stated in the DSPA Constitution, the Board should consider the application.

REPORTS FROM MEMBERS

Richard S. Boggs, dated 4/7/77

"I left HycoSub at the end of December to work freelance basing myself in London. Nothing too exciting yet but a charter with InterSub working off the Shetland Islands.

"Since Hyco will no longer be paying my membership and I am abroad, can you please inform me as to what the rate will be for membership and overseas mailing? I think air mail rates would be appropriate since they seem to send normal mail via Shanghai then by rail through India."

Ian Sanderson, undated, received 6/23/77

"We have just finished a five week project off the northwest coast of Vancouver Island, to determine the practicality of using a submersible to geologically map the continental shelf. The project went quite well after some initial problems, and hopes are that it will expand into a ten year project.

"Basically we were using Loran-C and a transponder system prototype from Mesotech in Vancouver. We ran transects across several contacts and faults, photographing and video-taping the bottom and collecting rock samples. We also made two dives down the edge of the continental shelf to our presently certified depth of 2200 ft.

"For the next couple of months we will be undergoing a major refit while our mother-ship Pandora II is in the western Arctic carrying out a hydrographic survey. There is a possibility that we may be flying up to the eastern Arctic with Pisces IV, but this is not definite yet."

Robert Starr, dated 7/27/77

"I would like to let you know that I have left Hyco and now work for Martech International. We are presently operating the General Oceanographics Nekton subs and working on a submersible program of our own. Please address any correspondence to Martech in Houston."

Richard Slater, dated 8/77

"I've been in Australia on a Fulbright. Got in lots of diving on the reef, but the sub I was to use still is not completed. Plan to return next year for submersible work."

Merle Wilson (telephone report) of 8/26/77

OSHA's new regulation prohibiting "live boating" of divers below 200' goes into effect in October and has produced a flurry of interest in NEKTON operations as well as other manned submersibles and RCV's available for Gulf of Mexico operations, specifically for pipeline inspection.

NEKTON's have been quite busy in such operations this summer, inspecting up to 4 miles/day. Texas A&M has their Perry PC up for sale. General Oceanographics followed up their recovery of a BOP stack for Gulf Oil by an outstandingly successful removal of a wellhead base for the same customer. Normal recovery methods had failed. A drillship placed NEKTON on the bottom at the site of the abandoned hole. NEKTON attached lift cables, then lowered an explosive charge into the casing. The casing was neatly severed, and the wellhead base was hoisted with no further problem.

Mike MacDonald is now General Manager at ISE (International Submersible Engineering, Ltd.) in Vancouver, operators of TRUV (Tethered Remote Unmanned Vehicle).

BOSTON SUNDAY GLOBE *January 18, 1976*

Two sunken relics of the War of 1812 — the American-armed schooners Hamilton and Scourge — have been found in almost perfect condition on the bottom of Lake Ontario, a Canadian research specialist reports.

"They're standing upright on the bottom, guns on deck, with the masts, spars and bowsprits still in position. It's an amazing find," said Dr. Daniel Nelson.

The two vessels, converted from merchant ships at the start of the war between England and the United States, sank on the night of Aug. 8, 1813.

"They were hit by a violent squall," said Nelson, "and they set over and sank. They're now resting on the bottom, after 163 years, about 1800 feet apart."

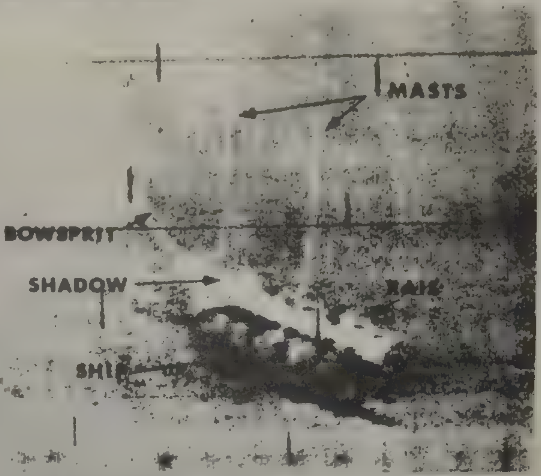
Only 16 were rescued of the approximately 100 men on board.

At the time they sank, said Nelson, the two craft were involved in actions that led to the capture of the town of York, which is now the city of Toronto. They had also helped capture Ft. George on the Niagara River.

Nelson, a dentist, has an office in St. Catherines, Ontario, but is also a research associate with the Royal Ontario Museum. He said he and colleagues discovered the two sunken warships last summer and fall.

"We've been involved in this for four years," Nelson said in a telephone interview, "and we probably covered 40 to 45 square miles in the search of the lake bottom.

"We used magnetic methods, side-scan sonar and radar navigation systems, plus an automatic data recording system," Nelson said. The two vessels — both 90 feet long, including bowsprits — were found about 15 miles west of the mouth of the Niagara River. They lie in 300 feet of water.



Klein Side Scan Sonar recording of the American Schooner Hamilton which sank in Lake Ontario during the War of 1812. Record was made with a Klein Model 400 HYDROSCAN System.

AUG 11
DSTP N.V.

REPORT ON ACCIDENT WITH THE MOANA III IN CALANQUE DE SORMIOU, June 30, 1976 at 15 h 50 local time.

"This report is made following above accident during which M. CROITORU Zecu, EDF, lost his life.

"The report is done with the following limitations:

- the report and statements taken by the Gendarmerie Maritime de Toulon are not available for COMEX
- no tests or calculations of possible flow-rates during the water entry have yet been done. Two cases must be checked. Firstly displaced O-ring and secondly the locking nut under the hatch preventing it from closing.

"COMEX Safety Inspector was onboard M/S BALDER DIVER support ship to MOANA III during the accident. COMEX inquiry started immediately after the recovery of MOANA III, the day of the accident and gave the following results.

"HISTOGRAM OF THE ACCIDENT (All times given are approximate).

15 h 15 2nd dive finished. Copilot P. WIDE leaves the submersible and observes that the o-ring is correctly in place.

15 h 30 MM. LEBOUTELLIER pilot and CROITORU enter the front sphere. MM. BON copilot and HACKE enter the aft sphere.

15 h 40 Launch procedure started. The hatch was closed by BON assisted by HJORT outside the submarine who checks that the o-ring seal is in place and that the locking nut has well entered the hatch. Leboutellier reports "HATCH SHUT Ready to launch" to the Surface Officer R. MORRIS.

15 h 48 The launch starts and the crane operator ROUVIERE picks up the submarine, swings with crane 180° and lowers the sub into the water aft of "Balder Diver", LEBOUTELLIER immediately slips the clamping bell.

15 h 50 Launch completed and diver GOTTLOW slips the tow line.

15 h 51 MORRIS the Surface Officer passed "clear to vent" to MOANA III. The message was acknowledged by LEBOUTEILLER the pilot. The surface officer immediately calls the COMEX pontoon to request that they carry out the UWT control. The message was repeated and acknowledged.

15 h 52 LEBOUTELLIER opens the vent value to fill the ballast tanks. BON is making communications check on UWT.

15 h 52'5": vent valve open

15 h 52'30": Ballast half full and vertical thrusters well in the water. LEBOUTELLIER runs the vertical thrusters for diving thus adding some 100 kg of dynamic load.

15 h 52'40": The hatch is covered by water and a small leak occurs. BON tells the pilot to surface and reaches for the hatch and it's (sic) locking mechanism, LEBOUTELLIER gives unconfirmed VHF-message, stops the thrusters and closes the vent valve.

15 h 52' 45": Vent valve closed and LEBOUTELLIER starts to blow ballast. HACKE observed BON doing something with the hatch and its locking mechanism. Water starts to rush in massively and LEBOUTELLIER turning his head remarks that he didn't observe neither (sic) BON nor (sic) HACKE.

15 h 52'50": BON is struggling to open the locking mechanism and push the hatch open while water is rushing in.

15 h 52' MOANA III hits the bottom at 42-45 m with a severe shock that snatches the wire holding the drop weight.

15 h 53'05" The submarine is pressure equalized and full of water except for an air pocket in the front sphere where LEBOUTELLIER, HACKE and CROITORU are breathing. BON opens the hatch and starts his free ascent.

15 h 53'35" BON is picked up by GOTTLOW, MASSU and NIELSEN. Alarm is given over VHF to BALDER DIVER who sounds general alarm. LEBOUTELLIER explains for the others how to breathe in the FENZY and how to make free ascent.

15 h 56' Zodiac arriving to BALDER DIVER. BON gets cardiac massage and mouth-to-mouth from Zodiac crew. Starts to breathe.

15 h 58' M. BON on deck on BALDER DIVER and given oxygen. M. DELAUZE and Zodiac crew preparing to dive.

16 h 01' Zodiac from COMEX pontoon on the spot with two divers.

16 h 02' LEBOUTELLIER observes through the top view-port that the hatch is wide open and tells HACKE and CROITORU that they are going to make a free ascent. LEBOUTELLIER leaves the submarine.

16 h 02'30" LEBOUTELLIER reaches surface and is picked up by the COMEX Pontoon Zodiac. CROITORU leaves the submarine in an attempt to free ascent but passes out.

16 h 04' CROITORU is found floating about 5 m above the submarine, unconscious, by the divers from COMEX Pontoon. The Zodiac from BALDER DIVER arrives.

16 h 05' MM DELAUZE and GOTTLOW dive and find HACKE in the front sphere. M. DELAUZE attaches a marker buoy to the submarine; CROITORU is brought onboard the COMEX Pontoon Zodiac.

16 h 06' HACKE leaves the submarine and is on his way up assisted by GOTTLOW and another diver.

16 h 06'45" HACKE is brought onboard the BALDER DIVER Zodiac.

16 h 08' LEBOUTELLIER and CROITORU, who is drowned, are brought onboard the Pontoon and resuscitation continued.

16 h 10' HACKE is brought onboard the Pontoon.

TECHNICAL EVIDENCE - The hatch locking mechanism is in my opinion strong enough to hold the hatch tight when diving but has the following drawbacks:

- It is not possible for the copilot to lock the hatch without help from outside.
- The copilot can't actually see if the dog has entered correctly.

- There is no index showing which way to turn to open or close.
- If unlocked, the dog might fall under the hatch and prevent it from closing.

The submarine was in operational order when the dive started and no technical failure has been found that could be the origin of the accident. The closing of the ballast purge valve takes 5 seconds and the blowing of ballast approximately 15 seconds. In other words, the submarine has 800 kg positive buoyancy 20 seconds after the pilot starts his manoeuvre to blow ballast. Consequently the flow of incoming water must have been greater than 40l/sec in the beginning of the dive when the failure occurred.

The total volume of the submarine hull is 5m3 and if we assume that the air pocket was 500 l there is 4500 l to fill up before the sub is pressure equalized. This happened some 20 seconds after the inrush of water. Consequently the flow of incoming water must have been at least 225 l/sec. during the major part of the time before equalization.

RESCUE AND SALVAGE RESPONSE-TIME

The first alarm was given less than one minute after the accident and the first divers on the spot 9 minutes after. The submarine crew was onboard either BALDER DIVER or COMEX Pontoon 15 minutes after the accident. This response time is extremely short.

The salvage operation was finished some five hours after the accident. This time is very short.

CONCLUSION

The accident was due to a wrong manoeuvre of the hatch locking mechanism by the copilot Michel BON who probably opened it close to surface when he tried to seal the hatch by tightening the locking mechanism.

The o-ring seal on the hatch is not always completely water tight at surface when there is little or no pressure on it. Some water may then enter the submarine through the hatch seal when going through surface. This probably prompted the fatal action by the copilot.

/s/ Peter WIDE
Safety Inspector
COMEX SERVICES

MARINE TECHNOLOGY SOCIETY

SUBMERSIBLE SOUNDINGS

A Newsletter of the MTS Professional Committee on Undersea Vehicles
No. 6 -- 27 June 1977

Co-Editors

Professor Gene Allmendinger
Kingsbury Hall
University of New Hampshire
Durham, New Hampshire 03824
(603) 862-1383

Mr. Michael Mulcahy
Associate Editor
Sea Technology Magazine
1117 N 19th Street, Suite 1000
Arlington, Virginia 22209
(703) 524-3136

Committee Chairman

Mr. Joseph R. Vadus
Office of Ocean Engineering
National Oceanic and Atmospheric
Administration
6010 Executive Boulevard
Rockville, Maryland 20852
(301) 443-8385

OTC Bi-Annual Meeting Report

The Bi-annual, General Meeting of the undersea vehicle committee was held at OTC, Houston. There were about 60 members in attendance, including many from abroad. Guests included MTS President P. Eisenberg and Dr. Matsuda, Director of JAMSTEC. MTS Vice President for ocean explorations, Andre Galerne gave an overview on the extent of undersea vehicle activities and Chairman, J. Vadus gave a summary report on committee activities. The 125 member committee is subdivided into three Subcommittees: Manned Vehicles (Submersible Safety), unmanned vehicles and undersea habitats.

The USV Committee offered to incorporate intact as an autonomous subcommittee, an existing group dedicated to Undersea Science headed by Drs. R. Given and A. Pilmanis of USC's Catalina Center. However, this group wishes to establish an independent committee, and this matter has been referred to the chairman, Professional Activities Board, and the Blue Ribbon Committee dealing with committee policy.

The Manned Vehicles (Submersible Safety) Subcommittee chaired by John Pritzlaff is developing Submersible Safety Standards under a Coast Guard contract jointly funded by Navy and NOAA for a total of $30,000. Pritzlaff gave a progress report on the activities of the three working groups developing standards on: personnel qualifications, operating plans and procedures, and equipment. These groups include representatives from most of the major companies operating submersibles, insurance companies, and classification agencies. The three working groups have each convened twice and the material generated will be prepared in draft form to complete Phase I of the program this September. Additional support will be sought for Phase II to prepare the material for final draft form in accordance with the adopted outline.

A submersible safety symposium will be held in London or Paris during the summer of 1978. The three working groups will present their results and recommendations for final review before all groups including others active in submersible operations. The objective of this symposium will be to obtain a final markup, including consideration of relevant comments and recommendations received from others outside of the working groups, invited to participate as observers. A final draft will then be prepared and submitted to complete the project. MTS plans to publish this work as a separate book in the Submersible Safety Series. The adoption of these standards by the Submersible Owners and Operators are expected to improve operating safety and provide more consistent and perhaps lower insurance rates.

Ivor Lemaire and Sam Kelly, co-chairman of the subcommittee on unmanned systems reported that they now have over 20 members, and are now trying to identify potential projects and sponsors.

Dave Adkins, Battelle Institute Columbus, chairman of the subcommittee on undersea habitats reported that they have 18 members and are now planning to establish a charter to be drafted by D. Adkins, R. Hittleman of Hydroproducts, R. Saxon of Perry, and E. Finkle and W. Muellenhoff of the MUS&T office. Though there are few habitat activities, the group plans to identify potential projects such as development of standards for habitat operations.

Professor Gene Allmendinger, University of New Hampshire, proposed that the committee undertake a study to define undersea vehicle mission requirements for the year 2000, along with a projection of future system design trends. Jack Boller, Director Marine Board, indicated that a cost-effectiveness study be conducted comparing the various manned, unmanned and diving systems options using several typical missions as a basis for comparison. These proposals will be further reviewed and developed, sponsors solicited and study groups formed.

Two Undersea Vehicle sessions are planned for Oceans 77 in Los Angeles: one primarily on manned systems chaired by Frank Busby of R.F. Busby Associates; and the other on unmanned systems to be chaired by Ivor Lemaire, Naval Ocean Systems Center (NOSC), and Sam Kelly, Interstate Electronics.

John Manuel, Perry Submersibles, reported that there are over 21 submersibles operating or available in the North Sea, and of these, about 16 are Perry built. He reports that the North Sea operators are now talking about 250 day operating years including working through the rough winter months. Perry delivered two PC 1203 submersibles to COMEX and two PC-18 diver lockout submersibles to Inter Sub in France. A third PC 18 is under construction as well as a PC 1205. There is a trend for equipping manned and unmanned submersibles with manipulators for more work missions. Perry is now providing Silver Zinc battery pods for 50 kilowatt hours operation with capabilities for extending to a 200 kilowatts hours capability. Their unmanned vehicle RECON II has been successfully operating with a Shell Oil Co. pipeline barge and recently was used to inspect and video tape 56 joints of pipe. The RECON II is 42 inches long, 38 inches wide and 32 inches deep and weighs (in air) 620 pounds and can be quickly deployed from a ship. As demonstrated in the North Sea, the vehicle can also carry up to 100 pounds of auxiliary equipment. In addition to inspection of lines, the RECON II with its manipulator, attaches lines, operates controls and valves, retrieves objects, locks onto structures for extended observation and is adaptable for special tasks.

E. Finkle, of NOAA's MUS&T Office, reported on the progress of OCEANLAB. Mission Analyses and operating requirements were prepared with assistance from the NOAA Sea Grant Office. A concept study performed by GE with Perry as a subcontractor resulted in three basic concepts: One provided a dedicated ship with two portable labs and a small diver lockout submersible; and another featured a towed habitat system. Both of these are surface dependent systems. The third concept was a self mobile, autonomous submersible about 125 ft. long capable of carrying a 17 man crew and performing diver lockout submersible. Phase II of the OCEANLAB Project, the system definition study, will begin shortly. It was also noted that the three year lease of ALVIN by NSF, Navy, and NOAA terminates this year and is now being considered for renewal.

Drs. Matsuda and Owada of JAMSTEC reported that the Japeneese Government has authorized building a submersible without diver lockout, with a 2000 meter depth capability.

Booker T. Washington of International Underwater Contractors (IUC) indicated that their Beaver Submersible is being rebuilt, and they have completely rebuilt the inside of Mermaid II making it capable of carrying 3 persons. A special portable submersible handling system has completed tests and is now ready for operational use.

Dominque Girard, CNEXO reports that they are planning a 1500 ft. dive in the Atlantic in June with 6 divers from COMEX and the French Navy. A French Co. has a 20KW fuel cell power source with operational capacity for obtaining 60KW. This represents a 5 to 1 improvement in watts per pound over lead acid batteries. CYANA submersible has been busy over the last year in surveying the path for a pipeline from Algeria to Spain to depths down to 2200 meters. Also, there are plans for CYANA to conduct geological surveys off the coast of Corsica and Portugal this September and October. CNEXO is developing unmanned observation and photographic systems. One is similar to Scripp's Deep Tow and the other a robot vehicle controlled by acoustic transmissions. Mr. Girard believed that a study about future requirements and trends for USV's is needed.

Bob Hittlemen, Hydroproducts reports that they introduced their new unmanned RCV-150 series which included a manipulator for undersea work. They now have 8 unmanned inspection vehicles (RCV 225's) operating world wide with plans to build four RC 150's by the end of summer.

Roger Cook, Harbor Branch Foundation reports that JOHNSON SEA LINK I & II are active off the Florida Coast. Their Sea Guardian Rescue System including the Cable Operated Recovery Device (CORD) is also operational. They are building a third submersible this year using two acrylic spheres ("Dubble Bubble"), at either end for maximum visibility and manipulators on both ends. Work on a second generation CORD system with a 3000 ft. capability is underway. Harbor Branch is working on an engineering model of a semi submersible about 25 ft. long to get data to enable building a system for carrying two diver lockout submersibles at sea to enable working in very high sea states. They are also conducting a feasibility study of an unmanned, untethered vehicle. Around August 1, Harbor Branch is planning to use their submersibles for a photographic survey of the monitor in 220 ft. of water off Cape Hatteras.

Mr. Girard, Deep Diving Systems, Thunder Bay, Ontario reports they are building a new tethered, hyperbaric submersible called "CONSTRUCTOR". Their mission objective is archeological salvage with plans for use in Lake Superior and Ontario. The Draeger Co. built the hull and they are seeking ABS classification to 1600 ft.

Mr. Herb Nielson, Kockums Shipyard, Sweden, reported on construction of their URF rescue submersible capable of rescuing 25 persons. Diver lockout capability to 300 meters. He also described their design of a 500 ton submarine-like vehicle with diver lockout capable of accommodating an eight man dive team. The sub is capable of a 2 week mission and 2 days operation without recharge.

A report from Horton Maritime indicates that BEN FRANKLIN is still in storage, and AUGUST PICCARD is completing trials and will be fully operational by the end of summer at which time a survey will be made offshore from Vancouver to Vancouver Island. A new coring device is being developed for the AUGUST PICCARD.

A report from MIT indicates that Professor Carmichael's robot submarine is incorporating a side scan sonar. MIT's Bill Sheridan is publishing a report containing a compilation of underwater tasks.

Dave Adkins, Battelle reported that they developed the hydraulic system for Hydroproducts RC 150 unmanned vehicle. They incorporated an 18 pound manipulator that can lift 35 pounds while fully extended to 36 inches. Battelle updated a survey of unmanned vehicles using open source references.

Cdr. Pat Raetzman of CNO's OP-23 Office coordinates Navy's Deep Ocean Search and Location Program including operations of TRIESTE II, SEA CLIFF, TURTLE, CURV III, RUWS, NR-1, DSRV-I & II.

Cdr. Norm Estabrook, Submarine Development Group One, reports that TURTLE will be operating at a test range in Hawaii recovering hydrophones, torpedoes and ordnance. SEA CLIFF is being refurbished in San Diego, and will be used with Lockheed's support ship Transquest. SEA CLIFF and TURTLE are now capable of land transport and air transport via C5A. A new handling system for these two vehicles will be ready next year. SEA CLIFF will be modified over a four year period to achieve a 20,000 ft. capability. DSRV's I & II have completed technical and operational evaluation and are ready for fleet operation August 15. TRIESTE II will not be retired but used to retain a 20,000 ft. depth capability until the RUWS system is operational with SDG-1. TRIESTE II has been recertified for 17,250 ft. and is being prepared for 4 months deployment on the East Coast for missions in the Cayman Trench, Puerto Rican Trench and Blake-Bahamas outer ridge. SDG-1 has included a small portable side scan search system for use with a shore radar ranging system.

The Naval Ocean System Center has developed their Work System Package project that is ready and adaptable for use with CURV III, RUWS, SEA CLIFF, TURTLE, AND ALVIN. It has been tested at sea with CURV III.

John Pritzlaff reported on secondary battery system developed at Westinghouse for undersea applications: Iron-Silver battery at 40WHRS per pound; and Iron-Nickel battery at 20WHRS per pound with a 10 year life.

It was also reported that the Navy is incorporating a 30KW fuel cell on board Lockheed's Vehicle "Deep Quest" for at sea evaluation.

Howard Wheeler, Naval Ocean Systems Center reported development of one of the largest (14 ft. high) tethered vehicles for NASA's use in recovering solid propellent boosters associated with their Space Shuttle program.

HYDROSPACE SERVICE VEHICLE

John Ritter, President of Hydrospace Systems Inc. provided updated information on their HYDROSPACE SERVICE VEHICLE (HSV) Project aimed at providing an autonomous diver lockout mini submarine that can provide year round operation for a variety of undersea tasks associated with offshore development.

The proposed HSV will have the following characteristics: operating depth down to 1,000 ft.; normal mission time of 10 days with a continuous bottom time of 2 to 3 days; surface speed of 9 to 10 knots; and a surface range of 1,000 to 2,000 N. miles. Its size is 115 ft. in length and a beam of 26 ft.

Navigation & electronic equipment: radar, loran, gyro, SSB & VHF radio, doppler speed logs, sonar, underwater telephone, pinger ranging & navigation equipment, underwater TV and video recording equipment.

Under water tools: Various hydraulic tools such as impact wrenches, chippers, grinders, saws, bar cutters, jacks, oxy/electric burning equipment, electric welder, lights, air bags, water jet equipment, water blaster if required, miscellaneous hand tools.

Complete six man saturation system will allow one or two divers to work outside the vehicle in four 8 hour shifts. Hot-water-heated suits will allow long effective work periods. Since the HSV operates on the bottom, the resultant short umbilicals (gas and power) provide more efficient tool use and less down time.

New Unmanned Vehicles

SAAB-SUB: The Aerospace Division of SAAB-SCANIA, one of Swedens largest industrial groups has developed SAAB SUB, a remote controlled system for performing offshore underwater work at depths down to 700 meters. It is approximately 3.5 meters in length, 2 meters wide and weighs 3 tons. Work is performed using two grabber manipulators which hold the sub on site and one dextrous manipulator which performs the tasks. Two operators topside handle the system, one maneuvers the vehicle and the other operates the manipulators and tools.

CETUS: Based on their operational experience with their tethered remote operated vehicle TROV, ULS Marine Limited of the United Kingdom developed the Computerized Exploration & Technical Underwater Surveyor (CETUS) mainly for survey and inspection projects at depths down to 460 meters. The vehicle is approximately 2.5 meters in length, 1.5 meters wide and weighs about one ton. It is designed to provide automatic control of sumbersible functions using a digital computer. As an example, it can automatically steer the submarine along buried pipelines using signals from ULS magnetic gradiometers. Navigation is accomplished by a separate computer based transponder system and this information is displayed at the topside control station.

CONSTRUCTOR: This system briefly covered in the OTC report by Mr. Girard is under development by Deep Diving Systems Ltd. The design overcomes the power-duration problems typical to small manned submersibles and provides data acquisition and surface monitoring at the work site. Surface supplied power, communications, hot water and high pressure gasses provide for the diver lockout operations. An articulated arm with force control on all functions can lift 200 pounds at full extension and pick up fragile artificats without damaging. The variable ballast system provides for 1200 pounds of additional payload.

Oceaneering International Announces First Contract for "Arms" Diving System

Oceaneering International, whose Atmospheric Roving Manipulator System (ARMS) was introduced at the OTC, has announced that it will be used in the North Sea and North Atlantic off Greenland by Pacnorse Drilling, Inc., Bergen-DGeggen, Norway. When the drillship Pacnorse I, presently under construction, is completed, ARMS will be installed aboard her.

Although not a new concept, the force-feedback manipulator developed by General Electric for this system exhibits considerable manual dexterity by remote control of the operator. Called Diver Equivalent Manipulator System (DEMS) permits the operator to "feel" the work task even when visibility is poor. Tasks within the capability of the DEMS come under the categories of offshore exploration and production and salvage or rescue. They include positioning of valves, drilling, line attachment, cable cutting, TV inspection, and operation of quick-disconnects.

Det Norske Revising Rules for Manned Submersibles

Work is in progress now and final revised versions of the 1974 tentative rules applying to construction and classification of manned submersibles should be out by the end of 1977.

The new rules will have some new sections governing handling of heavy underwater systems, manned underwater systems and sub-sea completion systems. In addition, submersibles for working operations and inspection applications, self-supporting diving bells and lock-out submersibles as an alternative to diving bells will be considered in the new rules.

British Isles Trip Report

Committee member Frank Busby recently completed a visit with the operators and manufacturers of manned and remotely controlled vehicles in the British Isles. He reports that manned submersible leasing activities for the major operators (Vickers, Northern Offshore, Ltd. and P&O Subsea) are high and the field is dynamic. As an example he quotes Northern Offshore Limited's 1976 Annual Report statement that 1976 total revenues from the lease of five submersibles was $10,665,000, an increase of almost 50% from the $7,216,000 billed in 1975. All submersible operators are heavily involved in development of work tools and work techniques in support of oil and gas. While inspection and TV documentation is still a basic submersible task, the major emphasis is now towards manipulative work tasks and diver support. "The North Sea operators", according to Busby, "made real the dialogues and dreams of the sixties . What we in the U.S. proposed, they are doing, and under conditions of incredible severity".

The remotely controlled vehicle has begun to carve out its niche in the offshore fields. After a somewhat spotty initial performance, many of the problems have been identified and overcome. Perhaps the most serious problem, said Busby, was the idea that an RCV (a general term, not meant to single out Hydro Products) could be used from any available platform. As the submersible operators of the sixties learned - and in many instances too late - the vehicle is only one part of a system which includes a support ship, a handling system, and a support crew. The "ship of opportunity" brings with it a crew and a handling system of opportunity, not the best way to compete for a market where Sea State 6 can be the operating norm. There is no doubt that remotely controlled vehicles will find a variety of applications and widespread employment offshore, said Busby. The combination of manned vehicles with remote vehicles and one-atmosphere diving suits, which was the theme of his presentation to the Royal Society, seems a natural "fit" for offshore oil and gas support.

U.S. operators will have a chance to learn first-hand of the North Sea on 5-8 March, 1978 at Brighton, England. During this period, a full day session on manned and remotely controlled vehicles will be held at the "Oceanology International" conference and the speakers represent a wide range of North Sea experience.

Divers Fail To Sight Canadian Monster

KELOWNA, B.C. (AP) — More than six dozen divers with $30,000 worth of underwater photographic equipment have failed to surface with proof that the Ogopogo monster lurks, alive and well, in Lake Okanagan.

There is no official sighting of the elusive 50-foot, green and slimy monster that supposedly has haunted the 79-mile-long lake since prehistoric times, police said.

"I think they'd have given us a holler if they had," said a Royal Canadian Mounted Police spokesman.

The spokesman said the 80-member diving expedition, which started work Saturday night, did not attract much in the way of a crowd, though some residents of this city of 53,000 say Ogopogo has made at least four public appearances this summer.

"I turned around and there it was," said Lillian Volgesang, who said she saw Ogopogo two months ago while playing with her daughter in a park. She vowed never to swim in the lake again.

The first recorded sighting was in the late 1800s, followed by scores more in ensuing years — all remarkably similar.

Believers say their fishy neighbor could be a form of the Plesiosaur, a marine reptile plentiful 100 million years ago in the Mesozoic Era.

Sometimes reports of unnatural (at least to the observer) happenings in the area are deleted or otherwise suppressed presumably because their publication would open up new and difficult investigations not related to the mission in question. Such a case concerned a crew member aboard deep submergence research vessel Alvin:

Question — How deep were you when you saw the monster?

"We were down about 5,000 feet and then I went down into a crevasse about 300 feet deeper under a slight outcrop. We went deeper because the cable we were following spanned the crevasse. It was right there that I spotted it. The first thing I noticed was the movement. I thought we were moving along the cable and checked for drift but found that the sub was stationary and that it was the object that was moving. It then occurred to me that perhaps it was a utility pole, especially because of its thick shape.

"I swung the sub in an arc to get a better view along the cable or pole or whatever it was, when I was astonished to see a thick body with flippers, a long neck, a snakelike head with two eyes looking right at us. It looked like a big lizard with flippers — it had two sets of them. Then it swam upwards with its back turned before we could get the cameras angled. They were set to photograph 15 to 25 feet in front of the submarine and the thing had already swum out of the camera angle but was still around."

Q — What did you do then?

"I didn't like the way things were happening, so I came up."

Q — Did you report it?

"I talked about it. What can you say when you have nothing to prove it? You get laughed off the deck."

Q — Did you enter it in the log?

"I entered it in the wet log, but I don't think that it was put in the final log. I heard it was deleted by the Navy."

It is, of course, understandable that recording officers would hesitate to transcribe accounts of utility poles that metamorphosed into sea monsters, especially if such occurrences were not incidental to the mission in question.

Nevertheless, news of unusual incidents is often disseminated within certain service levels, presumably on a "need to know" basis, with appropriate threatening warnings applicable to personnel who discuss such matters outside of stated military confines.

© 1977, Charles Berlitz. Excerpted from "Without a Trace," published by Doubleday & Co. Inc.

A New Monster

Last year a team sponsored by the New York Times couldn't find "Nessie", the Loch Ness Monster in Scotland, but Japanese fishermen did find the South Pacific's answer to Inverness.

Trawling off Christchurch, New Zealand, they snared a dead creature about 32 feet long with four flippers and a long neck and tail. It weighed two tons. Having fish to catch, they eased it back into the ocean, not realizing that it may have had prehistoric origins.

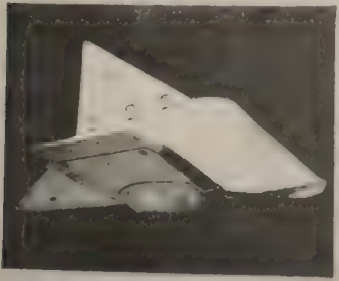
Japanese scientists are aghast that the animal was not preserved for study. They are speculating that it may have been a plesiosaur, a creature that is believed to have flourished 100 million years ago. If so, there may be others. The scientists conclude that it is "impossible for only one to survive." The paleontologists have their task cut out for them. If they can't find Nessie in a pond 24 miles long, one mile wide and 750 feet deep in Scotland, they are going to have a few problems in the 63,800-square-mile Pacific Ocean— and that assumes that Plessie can't swim around continents or through canals.

But make no mistake, Plessie is alive and well—in the minds of millions of monster fans whose imaginations have no boundaries at all.

Edo Western Corp. New Deep Tow Survey System

The new Edo Western 515A-604 Deep Tow Survey System uses a new hydrodynamically designed tow vehicle to provide efficient operation for deepwater side scan surveys in ocean depths up to 2,000 feet.

The highly successful 515A-604 tow vehicle combines an extremely stable tow characteristic with a very efficient depressor to achieve maximum tow depth without the aid of additional depressor equipment. The new tow vehicle is designed to operate with Edo Western standard 606 side scan sonar transducers or the complete series of Edo Western 515A Hi-PACT bottom penetration transducers. The side scan and bottom penetration transducers can be used separately or simultaneously.



Edo Western Corporation 515A-604 Deep Tow Survey System.

The unique capabilities of the 515A-604 system are also made possible by a multiplexed data transmission system. This method of data handling eliminates cross-talk between data channels, plus it permits use of simple cable designs.

The 515A-604 specifications are as follows:

515A TOW VEHICLE: maximum towing speed—12.5 knots; depth rating—500 to 2,000 feet, and weight (including transducer)—450 pounds nominal.

TOW CABLE: construction—double armored; diameter—0.46 inches; standard length--100 feet, and fairing—recommended for towing above 6 knots.

For complete information, write to **Robert Lapetina**, Edo Western Corporation, 2645 South 300 West, Salt Lake City, Utah 84115.

Sea Drillers Seek Glomar Explorer Use

The La Jolla-based Deep Sea Drilling Project has moved to acquire the 613-foot ship Glomar Explorer, which was used by the CIA to raise part of a sunken Soviet submarine from the mid-Pacific.

Dr. Melvin N.A. Peterson, DSDP director, told a news conference in Long Beach yesterday that a formal proposal has been made to the federal government to convert the ship for scientific drilling and turn it over to the project.

The ship, used clandestinely in the submarine recovery under the cover of a supposed Howard Hughes ocean mining scheme, is presently in mothballs in the Sacramento River Delta.

Peterson said it would cost about $50 million to restructure the ship for the purpose DSDP has in mind but that this would be far cheaper than building a new ship.

The refitted ship, he said, would be able to extend a riser pipe up to five miles long from the ship to the sea floor, to provide the added safety needed to bore into sediments likely to contain pockets of oil or gas.

All such formations must now be carefully avoided by project drillers because with their existing ship, the Glomar Challenger, drilling must be done uncontained with a bare drill string With the Explorer, the drill string would be turned inside the riser pipe, which would contain any oil encountered in drilling.

The ship would not purposely explore for oil, Peterson explained, but would be able to drill up a treasure of information about the earth's history that cannot now be tapped because of the oil blowout risk.

Ocean Floor Hot Springs Are Probed

Mounds on the Pacific Ocean floor at the source of volcanic hot springs were cored in the latest completed mission of the La Jolla-based Deep Sea Drilling Project.

A project spokesman said a series of mounds up to 50 feet tall along the most active volcanic zone of the Galapagos Rift were sampled off Peru.

The tests established that the mounds are hydrothermal sediments rich in iron and manganese and that they are sites of active venting of hot water from the ocean crust heated by deep volcanic sources.

The mounds were on the youngest ocean crust ever drilled, no older than about 610,000 years.

During the same cruise, the project ship Glomar Challenger also bored at seven sites into volcanic rocks at the crest of the East Pacific Rise, a place off Central America where new earth crust material is being squeezed up from the mantle to spread out in opposite directions away from the ridge.

The objective was to determine the composition, magnetic properties, structure and evolution of the rise crest by sampling the rocks.

An international scientific team on the cruise was headed by Dr. Bruce Rosendahl of Duke University and Dr. Roger Hekinian of the Centre Oceanologique de Bretagne in Brest, France.

Editorial

Larry L. Booda

Sea and Air — Inseparable

Reorganization fever is in the air. It is coming from the top. President Jimmy Carter is well aware that if he doesn't follow through with one of his campaign promises the initiative could well be taken by Congress. And when such an action comes from the two deliberative bodies on Capitol Hill the result would be a botched compromise document of dubious value.

As with many other components of the Executive Branch, those dealing with the oceans and atmosphere, especially the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, are considering reorganization possibilities. In the case of NOAA the possible upcoming Administrator (July 15) Richard Frank, solicited suggestions and comments from key officials.

NOAA is feeling the hot breath of Sen. Ernest F. Hollings, chairman of the National Ocean Policy Study (NOPS), who, in a formal address May 11, proposed formation of a new National Oceans Administration (NOA). His ideas on such a reorganization were contained in a NOPS study which had circulated earlier. (ST May, page 33) (His speech reviewed in ST for June, page 33)

Hollings proposed a three phase operation, taking the Coast Guard from the Department of Transportation, some programs from the National Science Foundation and some from the U.S. Geological Survey of the Department of the Interior into the new NOA.

But the blockbuster in his proposal is the removal of weather, satellite and atmospheric activities from NOA and placing them in the National Aeronautics and Space Administration (NASA). (There has even been a rumor that NASA would welcome not only the weather, satellites and atmosphere but the rest of NOAA to form a super-agency.)

At this point we want to say that we have commended Sen. Hollings many times on this page, especially in June, 1971, when we praised his proposals for enhanced oceanographic research. Unhappily, this time we must disagree with him.

Several times in his address Hollings cited the so-called "Stratton Commission" — formally called the Commission on Marine Science, Engineering and Resources chaired by Dr. Julius Stratton — and the blueprint it laid for the future.

The Commission's report, "Our Nation and the Sea", a monumental work of four volumes, left no doubt where it stood on the relationship of oceans and atmosphere. It recommended formation of a National Oceanic and Atmospheric Agency. And in that agency there would be a National Environmental Monitoring and Prediction System.

Now we must examine terminology a little. "Environment" includes the solid earth, the ocean bottom, all the land, the water in the seas and ashore, the atmosphere, the ionosphere and the sun. "Prediction" involves seismology, volcanology, geophysics, hydrology, oceanography, meteorology and aeronomy.

There is no way that long range weather prediction can come into being without complete interplay of the above disciplines. Weathermen can now issue five day forecasts with a reasonable expectation of accuracy. Thirty day forecasts are patchwork educated guesses. As for yearly forecasts the climatologists are just beginning to make use of computers to analyze past patterns tied in with solar radiation, earth radiation and the major ocean currents.

It is the last parameter, the currents, that holds the key to one-to-three month forecasts. They profoundly influence the weather of continents — the Kuroshio, or Japan, Current for North America, and the Gulf Stream for Eurasia. Since water is 800 times as dense as the atmosphere it has a tremendous capability of storing heat, or conversely, storing little of it. Like the air currents, the ocean currents move, produce cyclonic and anticyclonic eddies, but much slower.

With these simple facts in mind it is impossible to visualize how the oceanographers sensing the seas and meteorologists sensing the air could be effective divorced. Let us hope that a marriage counselor in the form of an alert administration mends this threatened split. We also hope that Sen. Hollings will reexamine the NOPS staff work and adjust what otherwise is a fine proposal. He is still the logical champion for an independent agency for oceans and atmosphere, reflecting the mission of the subcommittee he chaired until the current Congress.

PATRICK BUCHANAN

Torpedo Sea Law Project

The excessive greed of a handful of Third World diplomats has given President Carter the weapon with which to sink forever the United Nations Law of the Sea Conference — and reverse one of the major blunders of the Kissinger era.

First, some background. For 20 years the realization has been ripening that a treasure house of mineral wealth is lying on the ocean floor waiting to be picked up. Encased in potato-shaped nodules, "thick as windfall apples," says an expert, is enough copper to meet the world's needs for 6,000 years, enough aluminum for 20,000, enough nickel for 150,000

The United States is far ahead of any nation in having developed the technology to scoop up these nodules and haul them home by the boatload. Even a tiny fraction of that mineral wealth would reduce sharply our import bill, make the U.S. not only self-sufficient in several critical minerals, but a major exporter, and leave the West invulnerable to a Third World cobalt, copper, or nickel cartel — erected on the model of OPEC.

So why have the Americans not begun dredging up this mineral wealth from the ocean floor? Because, incredibly, we have been waiting for U.N. permission! Some years back, the U.N. decided these minerals were the "common heritage of mankind," over which it had jurisdiction. So for half a decade at six separate sessions of a U.N. Law of the Sea Conference, the U.S. has been trying to find the proper mix of concessions which would convince the diplomats from Sri Lanka and Cameroons to allow us to mine the ocean floor

The concessions served up have been startling.

If you will give us your blessing, said Henry Kissinger, the United States in return will support and subsidize an International Seabed Authority, whose mining arm, Enterprise, will be provided with U.S. money and technology and a comparable seabed all its own for every seabed developed by Western capital

But to many in the Third World the Kissinger concessions are unacceptable. The U.N. diplomats want the whole hog. They want the U.S. to hand over its mining technology to the U.N., and the Seabed Authority to be the ultimate arbiter over who may mine, when and where.

Even Elliot Richardson, Mr. Carter's envoy to the conference, as tolerant and liberal a Republican as can be found in the party hierarchy, was astonished at the rapacity and duplicity of his negotiating counterparts. He has recommended that Mr. Carter consider quitting the Conference altogether, before the seventh session begins next March.

Take the opportunity, withdraw our concessions and run, Mr. President. We will never find a better opportunity.

Important as future control of the Panama Canal.

Conservatives of both parties should notify the White House in advance that they will vote down any treaty which transfers U.S. technology to the U.N., or which vests authority over the oceans' seabeds in any international organization.

To do less is to let slide an opportunity to guarantee a measure of economic security for the future

---

Bitter U.N. Sea Law Conference Adjourns

NEW YORK — The sixth session of the United Nations Law of the Sea Conference adjourned yesterday, failing in eight weeks of acrimonious debate to break a deadlock between rich and poor nations over sharing the mineral wealth of the oceans

The mining dispute and bickering over lesser issues delayed completion of an informal draft treaty governing exploitation of ocean resources — a four year effort that many countries fear may be doomed if Congress passes legislation authorizing U.S. seabed mining in the absence of an international agreement

After a day of debate, delegates from 148 countries adjourned as scheduled without writing an "informal composite negotiating text" that was to be debated at the next conference session in Geneva, Switzerland, in March.

Deep Sea Mining

The United States has three basic interests in the Law of the Sea Conference, which has been in progress for the last eight years.

We want to discharge our responsibilities to international law and order. We want to be sure that U.S. commercial interests in deep sea minerals are protected. And we are willing to trade off some American technology and aid for mining, in return for assurances that nations controlling international navigational straits keep them open to shipping.

Ambassador Elliott Richardson's recommendation last week that the United States consider withdrawing from the conference is a troublesome indication that our goals cannot be achieved.

Mr. Richardson has a strong case for his point of view. The Law of the Sea Conference is no closer to settling the problem of how deep sea wealth should be shared than it was eight years ago. And if the present trend continues, the United States will not be able to accept the decision that the conference is likely to reach, if it reaches one at all.

Compromises by the United States have been generous. During his tenure Secretary of State Henry Kissinger promised the conference that the United States would subsidize deep sea mining authorized by the United Nations and that we would share our technology with other nations. Ambassador Richardson reportedly committed the United States to spend as much as $160 million to assist the International Seabed Authority's mining ventures.

The offers were rejected by Third World members of the conference, who constitute an overwhelming majority. Third World members insist that all deep sea mining must be conducted by the ISA. And they made it clear that ISA would control the volume of mining in order to protect Third World nations with mineral resources.

When the United States held firm, a group of delegates drew up a proposed treaty containing the Third World proposals — without consulting the United States. The proposed treaty will form the basis of discussions when the Law of the Sea Conference resumes next March in Geneva.

The United States is slowly being pushed into a corner. In effect the Geneva conference will consider a nickel, cobalt, manganese and copper cartel for the Third World, under the aegis of the United Nations. The United States would be expected to finance what deep sea mining is done, but share little, if any, in the rewards.

There is no reason why the United States has to put up with these tactics. We have discharged our international responsibilities by eight years of sincere negotiations. We have offered reasonable tradeoffs. In times of peace we would lose more by forfeiting treasures from the deep than we would in reduced traffic through international straits. At worst that has been estimated as a $100 million sacrifice. In time of global war the United States shouldn't have to worry about navigation. Which of the Law of the Sea conference nations could challenge us?

Ambassador Richardson is right. The time has come for us to consider withdrawing from the Law of the Sea Conference. The discussion should be deliberate and public.

In the meantime Congress should pass with dispatch measures that would pave the way for U.S. companies to begin mining ocean minerals. A bird in the hand, as the saying goes, is worth two in the bush.

6/12/77

Deepsea Miner Passes Critical Test

By CLIFF SMITH

Science Writer
The San Diego Union

The mining ship Deepsea Miner II has passed a critical test of its ability to suck up metal nuggets by the ton from the deep ocean floor.

Working in water approximately 1,000 feet deep 12 miles west of Oceanside, the [illegible]-foot converted ore carrier, successfully used its supersecret "vacuum cleaner" to raise to the surface a torrent of sand, fish and a 20 millimeter shell casing.

"This was cause for great jubilation on the ship because it was a very important test for us," said George Barnnett, a consultant to Deepsea Ventures, Inc., of Gloucester Point, Va.

"We will sail from San Diego on July 6 to test our unique nodule recovery system in deep water about 100 miles west of Southern California.

"If all goes well there, we will leave on our first major nodule recovery mission about the end of August."

The lure beckoning DVI, a joint venture of the U.S Steel Corp and Union Miniere of Belgium, is a bonanza of "black gold," so-called manganese nodules that pave many parts of the deep Pacific Ocean floor like cobblestones.

Rich in copper, nickel and cobalt, as well as manganese, these potato-shaped nuggets are viewed as a major new source of the four vital metals, which are fast being depleted on land

DVI has three other serious competitors but officers of the firm say they have a good head start in their patented "air lift" suction dredge.

Unlike conventional hydraulic lift dredge systems, which require enormous water pumps, the DVI system involves injecting a stream of air into the eight-inch dredge pipe. Nodules then theoretically, will be raised up to the ship in a partially bouyant slurry of water and air.

The 10th Avenue Marine Terminal in San Diego Bay has been home to the 20,000-ton ship for more than a year during outfitting and testing operations.

DVI officers say San Diego also could become an important base in the nodule mining industry.

Ray Kaufman, vice president for technical affairs, explained that nodule processing centers on coasts near the nodule beds will be desirable

San Diego is closer than any other U.S. port to some of the richest fields DVI has staked out one field for test exploitation in 15,000 feet of water about 1,100 miles southwest of San Diego in international territory.

The area is within a 4½ million-square-mile triangle, dubbed the "mother lode," where the nodules lie virtually shoulder-to-shoulder

TINY SUB CAN FIND BIG LOOT

FRESNO, CALIF.—Bob Tostenson is a scavenger, but hardly a garbage man. Although it is no 9-to-5 job, he is confined to his seat in a small work area.

Tostenson contracts for freshwater recovery diving in his own single-seat submarine, which he says recovers objects at depths where divers cannot work effectively. He says he has recovered sunken cars, boats, guns, assorted valuables and an occasional body.

The submarine is about 11 feet long and weighs 3,500 pounds. Tostenson, seated in a small chair, pilots it to depths of 250 to 500 feet. There is no room inside to stand.

He locates objects by following systematic search patterns over the floor of freshwater lakes, streams, ponds and rivers. Areas are divided into quadrants and each area is explored in sequence.

He charges $400 to $1,500 a day, depending on the value of the lost object and the difficulty of the terrain. If it is heavy and bulky like a car or boat, cables are attached and the sunken item is reeled in by barge.

If divers attempted to stay submerged as long as Tostenson's vessel, they would suffer "the bends," a condition caused by imbalance between pressure inside the body and the pressure outside. The submarine overcomes this danger because the pilot is in a pressurized chamber.

Tostenson says he enjoys his work because, "It allows me to do something different every day, meet a new challenge and solve a new problem. I'm just turning sport and my love of water into a profession.

2534c

SUB TO PHOTOGRAPH LAKE WRECKS

Philip Laub, 27, stands in the hatch of his 12-foot submarine and shows a piece of equipment to William C. Wittkowsky, the mayor of North Tonawanda, N.Y. Laub, an auto plant worker at Tonawanda, plans to use the sub to film a documentary about sunken ships on the bottom of Lake Erie.

Aircraft Salvage Project at Wake

"Turtle," a deep-submergence vehicle, will arrive at Wake Island Saturday to take part in a Navy effort to raise the EC-130Q communications aircraft that crashed June 20, killing 16 men.

The Brunswick, a salvage ship from Pearl Harbor, is there now attempting to locate the wreckage in 1,800 feet of water

MERMAID II BEING USED BY NOAA

A series of undersea research projects investigating the effects of ocean dumping, the habitat and abundance of selected fish and shellfish, and undersea geology, is now under way along the Atlantic Coast, coordinated by NOAA. Scientists from the Commerce Department agency's National Marine Fisheries Service, the Interior Department's U.S. Geological Survey, and the Environmental Protection Agency are participating in the 6 leg cruise, which is expected to last 40 days.

The 3 man submersible MERMAID II, used in conjunction with support vessel EILEEN B, takes scientists to a maximum 1,000' depth to carry out their studies. The vessels are owned and operated by International Underwater Contractors.

Cruise coordinator is Elliott Finkle of the Manned Undersea Science and Technology office, a part of NOAA's Office of Ocean Engineering.

Scinetists from National Marine Fisheries Service, headed by Dr. Richard Cooper of the Northeast Fisheries Center, Woods Hole, MA, are surveying the geology of the Baltimore and Wilmington canyons on the first leg, and attempting to relate the bottom-dwelling animals to the kind of material that makes up the seafloor in those areas.

The second leg will take place from Cape Hatteras, N.C., south to waters off Georgia. Scientists from the NMFS laboratory in Beaufort, N.C.under the direction of Peter Parker, will carry out an extensive assessment of fish population. They will seek to identify habitats of selected species - primarily major sportfish such as snappers, groupers, porgies, and grunts - and measure their abundance. Scuba divers will assess reactions of the fish to the submersible.

U.S. Geological Survey scientists led by Dr. David Folger of the Woods Hole, MA laboratory of the USGS will survey the geology and biology of the southeast Georgia embayment on the third leg. The particular area is one where oil exploration may take place in the near future.

Dr. Donald Lear of the Annapolis, MD laboratory of the Environmental Protection Agency will lead the fourth leg, investigating the effects of ocean dumping off the Coasts of Delaware and Maryland, looking at bottom animals, taking samples, and observing areas affected by the dumping.

Jack Hathaway of the USGS Woods Hole laboratory will be principal investigator for the fifth leg of the cruise, in the Baltimore Canyon trough and part of Georges Bank. The team will examine gear left previously during a long-term study of the geology and biology of the areas.

Finally, Dr. Redwood Wright of the Northeast Fisheries Center, NMFS, will lead the final leg, an attempt to recover a current meter array at the eastern tip of Georges Bank. The array was lost last year when an acoustical release device apparently failed to operate. The array consists of 3 moorings, each with 3 current meters.

An underwater research project at the MONITOR Marine Sanctuary off the Coast of Hatteras, N.C., is being carried out by NOAA in cooperation with the Harbor Branch Foundation of Fort Pierce, FL, operators of the JOHNSON SEA LINK submersibles. Purpose of the project, which began July 17 and will end Aug. 8, is to compile a comprehensive photographic record of the condition of the Civil War ironclad, to assist NOAA in the management of the sanctuary.

The MONITOR Research and Recovery Foundation, Inc., will make an archaeological and environmental assessment based on videotape, film, and stereophotographs to be obtained during the project.

Operations Director for the personnel, equipment, and surface and underwater vessels is Roger W. Cook of Harbor Branch.

Stereophotography, the key to the operation, is accomplished by means of two cameras, mounted on one of the JOHNSON SEA LINK subs, which focus on a subject from different angles and provide a three-dimensional image. A photographic grid established by lock-out divers is used as a reference point by the submersible for taking stereo pair photographs. The resulting photo-grammetric analysis will determine the dimensions of the MONITOR and make possible measurements of the components used in construction of the vessel. NOAA believes that the measurements will be accurate to six millimeters.

Assisting in the development of the photogrammetric system is Dr. Donald Rosencrantz who used the technique to map the remains of a fourth century Roman shipwreck. (Ed note: Dr. Rosencrantz signed our covers for the ASHERAH dives at Yassi Ada , Turkey) Also involved is Dr. Harold Edgerton, who developed the Edgerton Deep Sea Standard Camera that will be used in portions of the photography.

Plans have also been made to raise a piece broken off the MONITOR from an earlier expedition, provided the integrity of the ship will not be affected. Special arrangements have been made with the Naval Ship Research and Development Center, MD, to conduct an analysis of the broken piece to determine the physical condition of the remains of the MONITOR and the extent to which the MONITOR can support itself in any proposed recovery effort.

The Fifth U.S. Coast Guard District is assisting NOAA and Harbor Branch in the project.

Operations Director Roger Cook holds the world's record for a 700' lock-out dive, the deepest on record from a submersible.

The MONITOR site was designated a Marine Sanctuary by the Secretary of Commerce on 1-30-75, under the authority of the Marine Protection, Research, and Sanctuaries Act of 1972. The sanctuary is an area of the Atlantic Ocean around and above the site of the MONITOR, which has rested for 114 years in 220' of water.

They have released data on the April dive stating that they found currents on the sea floor gentle enough for divers, that the ocean floor near the wreckage is cohesive enough to hold together if they decide to lift the vessel, and that the bow and the setern which face the ocean floor are supported from below which is important due to stress if they decide to try and lift the vessel.

Various reasonable and wild schemes have been formulated for lifting the ship, among which are: freezing the waters and ocean floor and lifting the entire package to shallow waters, another is the Glomar Explorer to dig under the ship and lift the entire mass, and another is dismantling the wreckage which appears to be the most difficult.

Thanks to Barclay Jones in St. Petersburg we now have more info about the sub in Clearwater. We tried several times to call the Condons and were not able to get them. Barclay got some help from Anne Graham, of the St. Petersburg Times, and got a reproduction of an article that paper printed on June 3 in their Clearwater edition. So a few quotes from that article..."The sub in question is the MARGENAUT, is 55 tons, can carry up to 10 passengers, is 65' long, and has a 10' beam. The sub was used in the motion picture AROUND THE WORLD UNDER THE SEA, which starred David McCallum and Lloyd Bridges. It has been seen many other times in movies and TV. The 9 year old sub is now in dry dock for work in Miami. Eugene T. Condon is an executive with Margen International Inc. They plan to dive on the "Atlantis pyramid" in late summer."

I received a letter from Mr. Robert Pierce whose mail was being returned from the New York address. He advises that a new company has been formed to produce the submersibles he formerly built under the name of Pierce Submersibles. The new company is Seahawk Oceanics, Inc., 800 N. Great Southwest Parkway, Arlington, TX 76011. The company plans to conduct tank tests and complete formal ABS certification by the end of August,

Ed Bland sent a nice report on ALVIN activities as follows: "ALVIN and LULU arrived home yesterday afternoon (6-16-77) and ALVIN has been off-loaded into our work area here. She will have about a month of voyage repairs and upkeep work and will return to sea on the 12th of July. For the remainder of the year, and until overhaul in Oct., we'll be operating locally out of Woods Hole - mostly for our oceanographic biologists. One trip back to the New Jersey dump sites for the EPA, maybe.

SURFACE CONTROLLED SUBMERSIBLE. EV-1 developed by the Ocean System Division of Kraft Tank Co., Kansas City, Mo., can reportedly carry out any task performed by a non-articulated manipulator. Consisting of a 1 500 ft main umbilical tether, current deflection weight and control console, the 235-lb unit can be propelled in any direction by three reversible hydraulic thrusters. Maximum forward speed is two knots. A fixed TV camera mounted high on the forward part of the submersible's frame provides viewing of both the manipulator and sea bottom on one of the control console's monitors. The other monitor displays information concerning the vehicle's depth, heading, hydraulic system temperature, etc. Dimensions for the unit are: length, 4 ft, 4 in., beam, 2 ft, 8 in., and height 2 ft.

Deep Dives To Probe Trench Off Bermuda

The Navy's San Diego-based bathyscaphe Trieste II, aboard a support ship, was in the Panama Canal yesterday, en route to the bottom of the four-mile-deep Cayman Trench south of Bermuda.

There, the bathyscaphe will give U.S. earth scientists a close-up view of the boundary of two great chunks of earth crust in collision.

The two crustal plates, called the North American and Caribbean plates, are slowly grinding past one another in an east-west direction, shaking the seafloor with a succession of earthquakes.

DEEPEST DIVES

The series of dives planned into the trench will be the deepest ever attempted for the purpose of studying the dynamic processes of the earth's crust, according to the Naval Ocean Research and Development Activity in Bay St. Louis, Mass.

Chief scientist for the mission will be Dr. Robert Ballard of Woods Hole Oceanographic Institution.

The Trieste also will investigate the possibility of finding active volcanoes near the fissure where molten basalt is being squeezed up out of the earth's interior to produce new seafloor.

Last year the Navy's small research submersible Alvin, limited to dives of 12,000 feet, did a study in the area that revealed what appeared to be a chain of volcanoes. Samples of fresh lava were dredged up from the bottom.

OTHER TRIPS

The bathyscaphe, launched from the support ship Point Loma, also will take scientists to the bottom of the Puerto Rico Trench, to the Blake-Bahama Outer Ridge, both in the Atlantic, and into the Middle American Trench in the Pacific off Central America.

Scientists of the Lamont-Doherty Geological Observatory at Columbia University also will take part in the expedition.

UNDERSEA NOTES

P. Eleson

Diving in the Deep

If all goes well by the time you read this, six divers will have proved that man can do useful work in 1,500 feet of water. In the final phase of Project Janus 4, the French diving and diving research firm of Comex is scheduled to saturate six divers to a 1,300-foot living depth and then put them out to complete a pipeline connection in 1,400 to 1,500 feet of water in the Mediterranean. Using the French ELF-Aquataine drilling vessel PETREL as a mother ship, the divers will live in saturation chambers on deck and move to the work site via transfer lock and diving bell. All gear and procedures were developed by Comex, including the "Comector" pipeline connection system.

Comex is a pioneer in deep diving—including the use of hydrogen-oxygen breathing-gas mixtures to delay the onset of central nervous system disorders at depths in excess of 1,000 to 2,000 feet. At such pressures the amount of oxygen in this otherwise explosive mixture is so low as to be below the flash point. This is a tricky business as divers on the way down must switch from a normal air mixture to helium-oxygen to hydrogen-oxygen—and, of course, the other way around on the way up. It is not known at this time if hydrogen-oxygen will be used in the 1,500-foot Janus-4 dive.

Deep Quest Goes to Work

The DR/V (deep research vehicle) DEEP QUEST, after a painful period of inactivity, is getting back to work. The vessel—which was developed under private funding in the 1960's by Lockheed Missiles & Space Company (LMSC)—was taken out of moth balls last fall and made a series of dives to 5,000 feet in preparation for its latest assignment. That is to serve as a test platform for the Navy's newly developed 30-kilowatt fuel-cell power pack which is to be installed on the Navy's DSRV's (deep submergence rescue vessels).

These submersibles, which are presently battery-powered, were designed and built by LMSC's "Skunk Works" (one of the Nation's most competent design teams—*e.g.*, the U-2 and the SR-71). They are intended to be able to rescue the crews of submarines from depths as great as 5,000 feet. They were ordered after the loss of the attack submarines THRESHER and SCORPION—both of which sank in water greatly in excess of their crush depths.

Even if the DSRV's had been available then, there would have been no one alive to rescue. The wreckage of THRESHER was finally found on the bottom in over 8,000 feet of water; SCORPION in over 10,000 feet. Since then the U. S., at least, has had no serious submarine casualties.

Mile-Deep Recovery

The CNEXO (Centre National pour l'Exploitation des Océans) submersible CYANA has recovered an experimental torpedo for the French Navy from a depth of 5,414 feet (1,650 meters). Though the torpedo had a pinger on it, it was very difficult to find; indeed, the search and recovery operation took four dives and 35 hours underwater. It was finally located on the side of a sharp fault running perpendicular to the Saint-Tropez Canyon in the Mediterranean near Marseilles. This veritable gorge is just under 100 feet wide and over 260 feet deep.

In order to reach and grab the torpedo, the CYANA's pilot had to back down into the canyon at a 45-degree angle—which he did successfully and without damage to the DR/V. Anyone who has piloted—or even ridden in—one of these vehicles will appreciate the skill required for this kind of operation.

All of which once again reminds this columnist that back in the 1950's a number of (mainly, though not exclusively) American companies—Reynolds Metals Company, General Dynamics Electric Boat Division, Lockheed Missiles & Space, Grumman, Perry Submarine Builders, International Hydrodynamics (now HYCO Ltd. in Canada), and others, invested their own money to get the whole DR/V business off the ground and into the deep sea.

Their boats were remarkably well designed and turned in a phenomenal safety record. The crews were dedicated and versatile, and with their boats produced a competent functional combination. There should have been a sound and growing market for their services—in the offshore oil patch, for scientific research, and for the Navy.

Except for the offshore oil industry where a sound (though not runaway) market has developed for the shallower, less expensive boats—mainly Perry's and HYCO's—the U. S. market has been pretty much a bummer. The U. S. Navy had to have its own DR/V's, which it built at considerable expense. After all these years, it is good to see DEEP QUEST off the shelf and in the water again. Now, if they would just get ALUMINAUT out of storage. . . . That probably will never be, however, for it is made of aluminum and bolted together, and Navy ship designers make theirs out of steel and weld 'em together. Never mind that ALUMINAUT has a potential depth capability of 15,000 feet and walking-around room inside!

Whither Sea Grant

Dr. Robert B. Abel has been "promoted upstairs" out of his job as director of the National Sea

---

Mr. Eleson is a consultant in marine affairs. A scholar and experienced author with a physics background, he has followed undersea warfare since World War II. Since 1960 he has been involved in oceanography and national ocean policy.—EDITOR.

-24-

Grant Program which he headed from its beginning in 1967. He formerly was with the Office of Naval Research and the old Interagency Committee on Oceanography. The Sea Grant Program is under the National Oceanic and Atmospheric Administration (NOAA), and during his tenure Dr. Abel resisted political attempts to subdivide and distort the program and the efforts of the Office of Management and Budget to kill it.

In one short decade he took a concept and built it into a program with a potential for national benefit at least as great as that already gained from the Land Grant Program. And it all is done at a minimum cost to the taxpayer, for it is not Sea Grant's mission to *do* or *build* anything.

Sea Grant's is a complex story. Somewhat after the fashion of the Land Grant Program 100 years ago, its function is to enable the diversified capabilities of large State university systems to be coordinated and brought to bear on the problems and opportunities inherent in the use and management of coastal and marine resources. It helps the private sector to realize a greater return on its efforts. It helps local, State, and Federal governments to make more realistic management decisions, and helps to produce a better informed electorate.

It does these things with a comparatively small budget which is half federally supported and half supported by local State and private funds ("matching funds"). It has been remarkably successful—already within sight of generating tax revenues (corporate, private income, and other) orders of magnitude greater than the budgetary costs of the program.

What's this got to do with undersea warfare and defense? The national well-being depends absolutely on superior competence and capabilities in the pursuit of all our national ocean interests. Submarine warfare cannot be isolated from the raw materials required to provide the military hardware, and the prospect is that before long the sea will become a major source of some of these. Naval operations cannot be isolated from offshore oil and supertanker operations. They cannot be isolated from ocean fisheries and oceanographic research. They cannot be considered as being independent of the international law of the sea, and they benefit from the growth in numbers and competence of ocean engineers.

In all these and other areas, Sea Grant is making major contributions. It has inspired and encouraged whole new concepts of marine-oriented education—with emphasis on interdisciplinary approaches. It has made a greater contribution, probably, than any other organization either at home or abroad in building knowledge and understanding of the issues, both present and prospective, involved in the law-of-the-sea deliberations. It is beginning to make substantial contributions to reducing our adverse balance of payments—which, in turn, affects inflation, the cost of imported raw materials and the prices we must pay for our weaponry at home.

The present situation should not be allowed to destroy the performance capability that has been so ably built up in Sea Grant and at such a bargain to the taxpayer.

Sharp Look Needed

The White House should take a sharp look at the whole structure of the Nation's nonmilitary ocean efforts. It should take a careful look at NOAA which, except for Sea Grant has been largely ineffectual. It should seek to discover the rationale behind OMB's resistance to any civilian ocean effort. If it does, it will find that in some cases (National Marine Fisheries Service, for example) OMB is more right than wrong, while in other cases it is simply blind to the national well-being.

The White House should also closely examine the National Advisory Committee on Oceans and Atmosphere (NACOA). This body of "outside experts" is supposed to be an independent advisory group guiding both White House and congressional policy with regard to America's ocean and coastal goals and how they are to be realized. Far from being independent, it is housed and housekept by NOAA right in NOAA headquarters in the main Department of Commerce building in downtown Washington, D.C.

Ever since the 1950's, the White House (including OMB) has resisted, if not fought, the development of any national ocean program—coherent or not. Thus it has ceded to Congress entire responsibility for the development of such a program and the design and establishment of the institutions for its execution (*e.g.*, NOAA and NACOA).

Congress, however, is not a stable continuum. Every two years the whole House and one-third of the Senate must stand for reelection. To make points and publicity with the home town folks, Congressmen will support programs they think have appeal. Then, two or six years later when the glitter is off this or that initiative, they will support others or seek to change what has already been done—not so much because a change is needed as because of a desire to show the voters they are out there fighting. Results are frequently counterproductive.

In the final analysis, the only answer may be for the White House itself to take the initiative and establish a sound ocean and coastal resources program.

Old and New Defense Budgets

Undersea warfarewise, there is little new or exciting in either the Ford administration's last defense budget or the Carter administration's first quick-and-dirty revise of same. The outgoing Secretary of Defense did decide: No more supercarriers, noting that latest cost estimates topped out at $2.2 billion.

Another item of the Ford Defense budget may be altered. That is the proposal that no new attack submarine designs be started for the 1980's decade and that such procurement will continue to concentrate on the $200-million-plus SSN-688 Los Angeles-class boats.

Since ASW is very much a numbers game, and since we are not likely to get nearly enough ASW submarines at this price, it would be surprising (and unfortunate) if a program for smaller, less costly escort submarines were not initiated—if not in a supplemental budget this year then in the fiscal 1979 budget to be submitted next January. ■■

UNDERSEA NOTES

P. Eleson

Lasers and Defense

This time, for a change of pace, this column starts off with shades of Buck Rogers, Flash Gordon, Star Trek, and that ilk—namely lasers. Lasers are of special interest, not so much because they have resulted in any startling breakthroughs in undersea warfare but rather because of the ever-widening diversity of potential applications and the profound impact they could have on weaponry in particular and warfare in general in the late 1980's and 1990's.

Lasers seem destined to produce tremendous changes in the nature of ground, air, and space warfare. Whether the subsea realm remains opaque to laser energy or whether substantial undersea windows are actually found, the nature and significance of undersea warfare is bound to change relative to the other laser-changed military environments.

If major undersea laser energy windows are found, the cloak of invisibility now enjoyed by submarines, if not stripped off, will at least be badly torn. If no such windows are found, that special characteristic of undersea warfare will become even more important both tactically and strategically. In any event, the widespread operational appearance of laser technology is bound to produce major changes in the nature of submarine launched antiship and antiground target weapons—for missile detection, tracking, designation, and destruction promise to be major laser applications.

Lasers also may result in wholly new pressure-hull materials technologies, and they seem destined to permit at least an order-of-magnitude reduction in the size of microelectronic chips, itself an already astounding technology. In time, they may result in even more accurate and precise inertial reference platforms—laser gyros already are being tested in aircraft.

A laser is a device which produces light at a single, discrete wavelength and transmits it in a columnar configuration. There is no energy loss from beam spreading or diffusion. The beam may be finer than a needle or quite large, and beams may be deployed singly or in large focused arrays. The levels of laser energy which may be concentrated on a target range from microwatts to megawatts. Transmission is at the speed of light, and the beam is easily and quickly slued.

Lasers have been produced at wavelengths ranging from the infrared through the visible, ultraviolet, and X-ray portions of the spectrum. Lasing materials include liquids, solids, and gases, while excitation modes range from chemical to electrical to other lasers.

Lasers already enjoy a variety of uses in medicine, science, communications, industry, and the military—surgery without knives, precision surveying and positioning, high-volume speed-of-light communications, welding and materials inspection, target designation and beam-rider missile guidance, space surveillance, etc. As this column has noted in the past, one or more undersea windows have been found for blue-green lasers, and their potential for underwater imaging and secure communications is being explored. There are a number of problems, not the least of which is range.

High-Energy Program

The Buck Rogers aspect of lasers, however, is found in the nation's tri-service high-energy laser (HEL) program coordinated and directed by the Defense Advanced Research Projects Agency (DARPA). This is a $187-million research program, up from $141 million in fiscal 1975. This pie divides thus: Air Force, $88.9 million; Navy, $46.3 million; Army, $26.5 million; and DARPA, $25.4 million. The main thrust of these efforts is the development of laser weapons, primarily though not exclusively defensive weapons. All three services would use lasers to destroy large numbers of incoming missiles—with the hypothetical ease of simply aiming a flashlight.

Mr. Eleson is a consultant in marine affairs. A scholar and experienced author with a physics background, he has followed undersea warfare since World War II. Since 1960 he has been involved in oceanography, national ocean policy, and related matters. —EDITOR

Technological Challenge

But what a flashlight! It's Buck Rogers' "zap gun" and Star Trek's "phaser" all rolled into one—or at least it will be when (and if) it becomes operational. It poses a tremendous technological challenge. Aside from the design and construction of the laser itself, there is fire control which will include hand-off from target acquisition, tracking, engagement scheduling, hand-off to the fine-pointer tracker, and damage assessment after laser engagement. If a large number of incoming missiles are to be destroyed, all these things must be done very rapidly and accurately.

The problems inherent in this kind of development are in various stages of solution. The disposing of large quantities of waste heat from high-energy lasers may be solved by using gas lasers, relying on the high-velocity gas plasmas to carry away the waste heat. Atmospheric (and other) distortion of the laser wave front may be solved by adaptable optical surfaces which will be deformed automatically to compensate exactly for such distortion. A model of the pointer-tracker system already has been successfully tested, and adaptable optics may soon be tested in this use.

High-energy lasers also may find application as satellite destroyers

Undersea Notes (Contd.)

and satellite defenders. They will be capable of transmitting large amounts of energy from one satellite to another—or from outer space to earth. DARPA hopes to develop a ground-based laser propulsion system capable of placing comparatively small payloads in earth orbit for $10 to $30 a pound, compared with $1,000 a pound by present methods and $400 a pound using a fully loaded space shuttle.

Using a ground-based high-energy laser, DARPA would beam energy to a rocket which would use the energy to heat an on-board working fluid (hydrogen) to 3,000 to 4,000 degrees Kelvin. Such a rocket would have a specific impulse of over 1,000 seconds—3 to 4 times better than that of present launch rockets.

That's just a little of present laser research and objectives. It is difficult to predict what it all means to undersea warfare. One thing is certain: This work is not a U. S. monopoly. The Russians are hot on quantum theory and are making a considerable investment in laser research Much of their effort is devoted to weapons, and they are pursuing some avenues we are not—and, of course, vice versa

Stand-by satellite-killer satellites could, on command, destroy large numbers of other satellites with repetitive high-energy bursts beamed across thousands of miles of space. This could severely disrupt, if not destroy, the satellite component of our global military command, control, and communications (C^3) system—depriving our submarines of their main means of talking back.

Space-Based Weapons

Lasers raise for the first time the practical possibility of space-based weapons usable against earth targets. A laser beam would not have to be decelerated out of orbit but could be aimed and fired line of sight. For all practical purposes "flight time" of the weapon would be instantaneous. If enough power could be brought to bear, it is theoretically conceivable that such weapons could be effective against submerged submarines—simply by vaporizing a hole in the sea to the submarine's depth.

Clearly, that kind of capability is some time in the future—if, indeed, it ever comes to pass—and we would have to be a lot better at pinpointing enemy subs than we are now.

Bringing lasers back down to earth, if the blue-green windows now being explored in seawater could be developed to an effective range of several thousand feet, they might play a significant role in monitoring barriers. Literally a laser fence—analogous to a radar fence—could be installed across constricted ocean areas which submarines have to transit to reach their combat areas. Again, this presumes considerable research progress and a highly sophisticated technology.

In the meanwhile, as this column has previously noted, the development of underwater lidar (light detection and ranging) is more a likelihood than a mere possibility. It could give tomorrow's deeper diving submarines a secure means of obstacle avoidance and might prove to be a useful tool in target classifica-

---

MEMBER HONORED

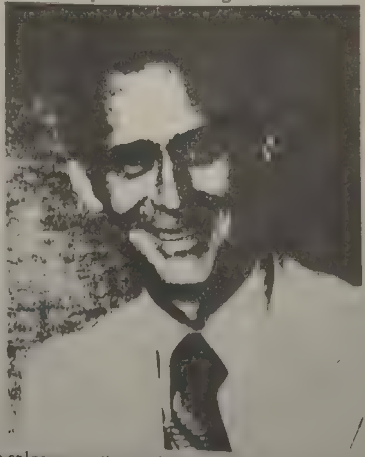
MTS founding member Frank Busby has been invited to speak before the Royal Society's Industrial Activities Committee in London 2 to 3 June, 1977, during their two-day meeting entitled "Sea-Floor Development—Moving into Deepwater." Mr. Busby's presentation concerns engineering aspects of manned and remotely controlled vehicles and consideration of the problems connected with sea-floor development to the depth of 2,000 meters beyond the present state of scientific and technological knowledge.

Mr. Busby is presently Director of Frank Busby Associates in Arlington, Virginia He is presently running for the position of Director of Public Affairs for MTS and serves the Society on the steering committee of the MTS Undersea Vehicle Safety Standards Subcommittee.

PERRY OCEANOGRAPHICS NAMES MANAGER

Ross E. Saxon, veteran submariner diver and sales executive, has been named sales manager of Perry Submarine Builders Division of Perry Oceanographics, one of the Society's industrial members.

He will be responsible for sales of diving systems, pressure vessels, SALM components and other specialty items. Before joining Perry, Saxon was operations manager for Seal Petroleum and then was a sales executive with HydroTech in London. He retired as a lieutenant commander in the Navy with extensive submarine duty, including that of pilot of the deep submergence vehicle "Trieste," an advanced submarine rescue ship



tion and localization. Possibly—if enough power could be brought to bear—submarine-mounted lasers could be developed to provide effective close-in defense against more conventional undersea weapons.

It is not possible to produce a reliable scenario of the impact of lasers on warfare 15 to 20 years hence. One thing is certain—when the high-energy laser weapon becomes widely operational it's going to be a whole new ball game (or war game), and submarine warfare will not escape the impact.

Law of the Sea

In case you hadn't noticed, virtually the entire Western Hemisphere—North and South America—is now subject to a 200-mile offshore jurisdiction of one kind or another. Canada, the U. S., and Mexico all have established 200-mile offshore economic zones. All but a very small number of the other nations of Central and South America have declared 200-mile territorial claims or exclusive economic zones.

Elsewhere, Russia, Iceland, and Norway have gone the 200-mile route, while South Africa, Australia, the nations of Western Europe (members of the European Economic Community), and others are preparing to do so. It is a trend that will only accelerate, and it is happening without any agreement among the participants in the United Nations' apparently endless law-of-the-sea meetings.

Almost without exception, this is how the international law of the sea has evolved—through custom.

There will be another Law of the Sea Conference this spring. It is unlikely that it will produce any more substance than those which have preceded it. Yet the pressure for changes in the law of the sea continues. The rash of tanker casualties off the U. S. coast earlier this year—almost all of them by ships registered under flags of opportunity (*e.g.*, Liberia and Panama)—has Congress and others primed to act in a unilateral fashion. Canada already has taken such unilateral action to protect her arctic waters from pollution. She has had her share of major oil spills, and it would not take much for Ottawa to extend the arctic pollution control jurisdiction principles to her southern borders.

Indeed, a logical evolution would be the imposition of strict pollution control regulations by coastal states within their 200-mile economic zones. It would not be surprising if this were the route taken by Congress. As bad as it is now, the hazard from supertankers is more in the future than in the present. This scenario is ably and informatively laid out by Noel Mostert in his book "Supership" (Alfred A. Knopf, Inc., New York, 1974).

Those interested in the law of the sea and the problems of trying to realize new rules for new situations through the conventional process may want to read E. W. Seabrook Hull's "The International Law of the Sea: A Case for a Customary Approach" (Occasional Paper No. 30, Law of the Sea Institute, University of Rhode Island, Kingston, R.I., 1976). ■ ■

Dr. Bruce C. Heezen, Ocean Bottom Topographer And Geologist, Dies Aboard NR-1 Submersible

Dr. Bruce C. Heezen, 53, whose ocean bottom maps have enjoyed worldwide circulation, died June 21 of a heart attack while aboard the Navy's nuclear powered NR-1 submersible. In early June he had been awarded the Walter H. Bucher Medal by the American Geophysical Union for his life's work of "original contributions to the basic knowledge of the earth's crust." In addition to that award he had received the Henry Bryant Bigelow Medal, the Cullum Geographic Medal and the Francis Shepherd Medal for excellence in Marine Geology.

At the time of his death Heezen, longtime scientist of the Lamon-Doherty Geological Laboratory of Columbia University, was studying the portion of the mid-Atlantic Ridge southwest of Iceland known as the Reykjanes Ridge, about 200 miles from Reykjavik at about 61 6° north latitude and 27 0° west longitude.

To the public Heezen was best known for the series of topographic maps of the bottoms of the oceans issued by the National Geographic Society based on bathymetric data furnished by him and his collaborator, Marie Tharp, also of Lamont-Doherty.

Hydro's Telemetry Multiplex System Helps Bury TAT-6

TAT-6 (Transatlantic Cable No. 6) commenced service June 30, 1976 enabling 4,000 additional transatlantic telephone calls to be carried on simultaneously. The cable burying operations were completed by the SEA PLOW IV, designed and built by Bell Telephone Laboratories.

Carried by the French cable ship VERCORS and controlled by Hydro Products' Communications Control and Viewing System (CCVS), the SEA PLOW IV successfully plowed the ocean floor along the Continental Shelf and buried the large cable which extends from Green Hill, Rhode Island to St. Hilaire, France.

The CCVS includes three television cameras, lights for each, a pan and tilt for each and a power and communication system. The latter conveys the plow status and transducer signals up to the ship and the plow control commands down from the ship to the plow through a control cable.

Altogether there are 37 commands that must be transmitted to the plow from the ship. These consist of eleven commands to control various plow hydraulic actuators, twelve pan and tilt controls, eight television zoom and focus commands and miscellaneous other functions.

Simultaneously, the plow must transmit six switch status signals, sixteen analog signals and three television video signals to the surface. The status signals indicate plow actuator limit positions. The analog signals represent plow pitch and roll, various hydraulic pressures, plow speed over the bottom, depth, temperature and the positions of some plow actuators.

The TAT-6 cable system has a capacity one and one-half times that of all previous transatlantic cables combined, providing better service and faster handling of the ever increasing volume of telephone calls between the continents of Europe and North America.

For more information on control/multiplex systems, contact Bob Melucci at (714) 453-2391.

Sonar Contact Loss in Storms Solved By Raytheon Engineer

A staff engineer for Raytheon Company, Submarine Signal Division, Portsmouth, R.I., has devised a way to prevent loss of sonar contact in heavy seas due to transducer motion. Arent H. Kits van Heyningen has invented a device for stabilizing the antenna of a small ship sonar system, and has recently been granted a patent for his invention.

Oceaneering To Market Saab-Sub Services

Oceaneering International, Inc., Houston, has entered an agreement with Saab-Scania A.B., Linkoping, Sweden, whereby Oceaneering will offer the services of the Saab-Sub, a remotely-controlled work boat submersible, to the offshore industry. It is scheduled to be operational later in the 1977 season, after completion of sea trials.

The Saab-Sub will provide diving services for exploratory drilling and inspection and repair of pipelines and platforms for subsea stations.

The work package of the system includes three manipulators and two TV systems. It is designed for use to depths of 700 meters (2,296 ft.), and is computer-controlled for several modes of automatic operation.

Hydro's new PATZ Camera Eliminates Need for Pan and Tilt

Hydro Products is currently developing a Pan and Tilt/Zoom (PATZ) camera that provides complete hemispherical viewing with a low light level TV camera incorporating an integral pan and tilt zoom lens.

The PATZ camera operates within a glass dome that is a part of its underwater pressure housing. It occupies only a fraction of the space normally dedicated to a camera mounted on a pan and tilt unit and has no external moving parts.

The basic system consists of the underwater camera and a small surface display and control unit that has all the controls necessary for remote operation of the pan, tilt, zoom and focus mechanisms. An alphanumeric display is included in the monitor picture showing tilt angle, pan angle and range to the subject in focus. Also superimposed on the video signal are reticle marks that indicate a constant angle of six degrees over the full zoom range and a three-inch height at the object in focus.

The system uses one coaxial transmission line for video and two-way radio frequency multiplexing of the camera remote control signals and uplink position data signals. Two additional wires for power are all that is required for system operation. System power is 115 VAC, 60 Hz; 230 VAC, 50 Hz, or DC voltage depending on the application.

For more information on the new PATZ camera contact Bob Melucci at (714) 453-2391.

))) **NASA Develops Enhancement Techniques for Deep Ocean Photographs.** Using techniques applied to unmanned planetary exploration (Mars) and satellite earth resources monitoring, scientists of the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory have been able to enhance, by aid of a computer, undersea photographs. They have been able to remove blemishes, apply radiometric and geometric corrections and improve detail. Bottom photographs suffer from uneven illumination and strobe-shield shadows that usually require manual dodging. Computer image processing brings out latent features and details not distinguishable by conventional photo processing methods by filtering and removing shadows. Sharpness of peripheral areas is improved. Similar techniques have been applied to side scan sonar images.

Horton Maritime Explorations Ltd.

THE COMPANY

Horton Maritime Explorations Ltd., a Canadian Company incorporated in 1970, is based in North Vancouver, British Columbia. Its function is to supply the services of the submarine, "Auguste Piccard", as an underwater work platform in waters of continental shelf depth and to provide engineering and scientific services and equipment related to geophysical explorations and engineering data acquisition.

The Company's submarine, "Auguste Piccard", is 28.4 metres in length, weighs 168 tons in air and has a designed depth capability of over 700 metres

THE SERVICE

The use of a submarine for simultaneous data gathering yields some definite advantages. Such advantages include improvements in accuracy by reducing problems caused by signal dispersion, diffusion and interference caused by bottom multiples. The quality and resolution of the acoustic profiling data often exceeds that which is normally stipulated as being the present commercial standard for overwater explorations.

Although the submarine is quite a large vehicle, it can be economically towed or driven under its own power for a range of up to 2000 nautical miles, or shipped as deck cargo to any operational area required.

THE SURVEY EQUIPMENT

Equipment on board:

- High resolution sub-bottom profilers
- Side scan sonar
- Bathymetry gear
- Data processing equipment, and
- A computerized acoustic positioning and navigation system

Additional geophysical equipment for the performance of specific tasks, such as gravimetric and magnetometric instrumentation, can be installed on board since sufficient space and power are available for that purpose

THE RECORDS

Horton Maritime will provide a complete sea-floor survey service which will include the reduction, evaluation, interpretation and presentation of the data, as well as position mapping services. Final data will be in a standard industry format for immediate use by the client or his representative and he will have access to all raw data, as required, to assist in the project evaluation.

HORTON MARITIME
EXPLORATIONS

For further information, please contact:

Horton Maritime Explorations
1174 Welch Street
North Vancouver, British Columbia
Canada V7P 1B2

Tel: (604) 980-8591

PRINTED IN CANADA

TAURUS

a new generation submersible from International Hydrodynamics Company Ltd. (HYCO)

Following on the success of the world renowned PISCES series of work submersibles, HYCO now introduces TAURUS with a much expanded capability. TAURUS offers:

- DRY TRANSFER INTO SUBSEA CHAMBERS
- DIVER LOCK-OUT
- TWO TON PAYLOAD
- UP TO 2,000 FT. WORKING DEPTH
- SUBMARINE RESCUE CAPABILITY

Aimed mainly at the offshore petroleum industry but also having military uses TAURUS is the result of more than three years work by HYCO's design and manufacturing organization which has built thirteen submersibles to date, all of which are presently operational. Seven of these submersibles are based in the North Sea offshore area. The reliability and advanced design of HYCO's vessels is a result of feedback from HYCO's wholly owned operating subsidiaries HYCO SUBSEA INC. of Houston, Texas, and HYCO SUBSEA LTD. of Vancouver, B.C. Canada. The HYCO group is the only organization of its kind that operates a service using its own designed and built submersibles.

Characteristics of the TAURUS series are as follows:

LENGTH	34 ft. max.
BEAM	13 ft. max.—reducible to 8'6" for shipping.
HEIGHT	12 ft. max.—reducible to 8'6" for shipping.
WEIGHT (dry)	53,000 lb. max.—reducible to 45,000 lbs. for shipping.
WORKING DEPTH	2,000 ft. (max.); 1,100 ft. (min.) dependent on type of steel used in hulls.
VIEWPORTS (External)	One 36" I.D. forward. Five ports in tower with 5" I.D. One lower aft in command chamber 6" I.D.
HATCH DIAMETER	Tower Entry—24.32" Bulkhead—27" Dry Transfer (double hatches)—38" major dia.; 35.5" minor dia.
SPEED	3 knots plus—depends on quantity of externally mounted payload.
CREW	Pilots—1; Co-Pilots—1 (a relief crew can be accommodated)
LIFE SUPPORT	Normal—500 man hours
BATTERY CAPACITY	1,000 amp. hrs. (8 hr. rate) Lead Acid
CARRYING CAPACITY	4,000 lb. distributed between personnel, equipment, etc.
GAS CARRYING CAPACITY	12,000 Std. Cub. ft. at 2,100 p.s.i. (available for diving mixtures).
DROP WEIGHT	1,000 lb. (movable for fore and aft trim).
PROPULSION	2—5 h.p. thrusters trainable port and starboard. 2—5 h.p. thrusters trainable vert. up and down. 1—5 h.p. bow thruster trainable in horizontal.
MANIPULATORS	Supplied to customer's requirements (normal 2).
CERTIFICATION	American Bureau of Shipping (A.B.S.) (or to special order).
AVAILABILITY	For sale or charter (customer training available).

TAURUS service can be offered through HYCO SUBSEA companies.

Your enquiries are invited. Please contact–

International Hydrodynamics Company Ltd.
P.O. BOX 1059
STATION 'A'
VANCOUVER, B.C. CANADA
Phone: (604) 688-8607. Telex: 04-55465 (THINKDEEP VCR)
Cables: THINKDEEP

HYCO Subsea Inc.
4800 WEST 34th STREET
SUITE C-7, HOUSTON,
TEXAS 77092, U.S.A.
Phone: (713) 688-6382
Telex: 00775914 (TOC HOU)

Above information correct when going to print. HYCO reserves right to change specifications as required by development.

Lithographed in Canada by Agency Press.

OCEANS '77 ADVANCE REGISTRATION

Make Checks payable to OCEANS '77 and mail with application forms to:

OCEANS '77
Suite 504
615 S. Flower Street
Los Angeles, CA. 90017

Name ________________________

Address ________________________

City, State, Zip ________________________

Company Affiliation ________________________

Memberships:

IEEE ☐ MTS ☐

Neither IEEE nor MTS ☐

Participating Organization: ________________________

Session Chairman ☐ Speaker ☐ Exhibitor ☐

Spouse to Attend ☐ Spouse's Badge to read ________________________

Registration	Advance Registration (postmark by Sept. 25)		Registration at Conference	
	Regular[1]	Package[1, 2]	Regular[1]	Package[1, 2]
IEEE/MTS or Part. Org. Mbr.	☐ $50	☐ $90	☐ $65	☐ $105
Non-Member	☐ $60	☐ $100	☐ $75	☐ $115
One Day[3]			☐ $20	
One Day for Educators[3]			☐ $15	
Student[3]			☐ $10	

Accompanying Person: Entire Conference ☐ $25 One Day ☐ $10

Conference Record:

Additional Conference Record

Member ☐ $26.25 Non-Member ☐ $35

Mailing Conference Record ☐ $4

Special Events:

Monday, Oct. 17, 1200	— Keynote Luncheon	☐	$12.50
Tuesday, Oct. 18, 1930	— International Banquet	☐	$25.00
Wednesday, Oct. 19, 1200	— Presidents' Luncheon	☐	$10.00

Social Functions:

A Night at the Music Center, Monday, Oct. 17 — To be announced ☐ $25

NOTES:

1. Includes conference record
2. Includes Special Events
3. Does not include conference record or special events.

TRAVEL AND HOTEL RESERVATION FORM
OCEANS '77
OCTOBER 1977
Los Angeles

Mail Direct to:

Cardillo Travel
10960 Wilshire Blvd., #926
Los Angeles, CA 90024
Attn.: Group & Convention Div.

( ) MR. ( ) MS. ( ) LAST NAME________________________________

FIRST NAME:________________________ ADDRESS________________________

________________________CITY:________________STATE:________________ZIP:________

SPOUSE'S FIRST NAME (IF ACCOMPANYING):________________________________

NAMES AND AGES OF CHILDREN (IF ACCOMPANYING):________________________________

____

I WILL SHARE A ROOM WITH:________________________________

ENCLOSED IS MY CHECK NO.:________________________IN THE SUM OF $________________

made PAYABLE TO CARDILLO TRAVEL to cover the following.

Deposit for travel arrangements $75.00 per person ($60.00 representing a deposit towards my Los Angeles hotel statement, and $15.00 for transportation from airport to hotel and handling charges) $________________

HOTEL RESERVATIONS in Los Angeles. PLEASE RESERVE MY ROOM(S) AT THE BONAVENTURE.

		STANDARD	MEDIUM	DELUXE
SINGLE	@	$33 and $35 ____	$38 and $42 ____	$44 and $48 ____
DOUBLE/TWIN	@	$43 and $45 ____	$48 and $52 ____	$54 and $58 ____
SUITE	@	$110 ____	and up ____	

THE HYATT REGENCY IN LOS ANGELES.

		STANDARD	MEDIUM	DELUXE
SINGLE	@	$36 ____	$44 ____	$50 ____
DOUBLE/TWIN	@	$46 ____	$54 ____	$60 ____

ARRIVAL:________________________DEPARTURE:________________________

POST-SESSION IN HAWAII:

Tour A (Land Cost Only) 5 Days/4 Nights in Honolulu

Double Occupancy	$159.00
Single Supplement	$ 92.00
Deposit of $50.00 per person	$________________

Tour B (land cost only) 8 Days/7 Nights in Honolulu and on Maui

Double Occupancy	$269
Single Supplement	$155
Deposit of $75.00 per person	$________________

I WILL SHARE A ROOM WITH________________________________

Send check to:

Cardillo Travel Systems
10960 Wilshire Boulevard #926
Los Angeles, Calif. 90024
Attn.: Group & Convention Division

PAYMENT FOR TICKETS

Airline tickets only may be paid for by American Express, Bankamericard, Carte Blanche, Diners Club or Mastercharge credit cards if preferred.

Please confirm my air reservation from my home city airport of________________________on________________(date) to Los Angeles with return on________________(date) to my home city airport. I wish to travel first class ( ) coach ( ) tour basing (if available) ( ) other ( ). I will pay for air travel on the basis of check ( ) credit card ( ).

CREDIT CARD NAME________________________________

NAME OF CARDHOLDER (please print)________________________ NAME #________________

AUTHORIZATION________________________________

EXPIRATION DATE________________ (SIGNATURE)

ADDITIONAL COMMENTS

____

____

PAYMENTS AND CANCELLATIONS

$75.00 per person plus appropriate deposit for Hawaii tour due by check upon making reservations. Final payment due no later than August 10 1977 (Cardillo Travel Systems will invoice all participants). Passengers cancelling their reservations after September 01 1977 will be subject to a charge of $15.00 per person to cover telex charges and handling fees. There will be no refund of monies retained by vendors, if any, or of unused tour services.

August 1977

ADDRESS CHANGES

BLAND, Ed - delete

BOGGS, Richard S.
ex-AQUARIUS I, PISCES
Res: 75 Cornwall Gardens
London, S.W.7
ENGLAND
Tel: 01-937-5889
Bus:

CAMERON, John
ex-TURTLE
Res: 8819 Shaula Way
San Diego, Ca. 92126
Tel: (714) 271-6809
Bus: USS SAN ONOFRE (ARD-30)
Fleet Station Post Office
San Diego, Ca. 92132
Tel: (714) 225-7204, 2237, 2238

JOHNSON, Philip E., Capt. USN
Res:
Bus: USS WHITE PLAINS (AFS-4)
Fleet Post Office
San Francisco, Ca. 96601

REES, Bob G., LCdr. USN
ex-TURTLE
Res:
Bus: USS GRAYBACK
Fleet Post Office
San Francisco, Ca. 96601

STARR, Robert J.
ex-PISCES
Res:
Bus: MARTECH INTERNATIONAL INC.
1802-D Afton
Houston, Texas 77055

TOGGWEILER, Martin - delete

DEEP SUBMERSIBLE PILOTS' ASSOCIATION

NEWSLETTER

January, 19~~7~~78

Vol. XII, No. 1 Published by the Deep Submersible Pilots' Assn.

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and material in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER should be addressed to:

Robert K. R. Worthington (714) 453-1158
Secretary & Editor, DSPA
3005 Curie Street
San Diego, Ca. 92122

Correspondence regarding new member applications should be addressed to the Membership Committee Chairman as follows:

Willis Forman (714) 273-2967
3940 Sioux Street
San Diego, Ca. 92117

EDITORIAL NOTES & COMMENTS

"Well, friends, '77 didn't seem to hang around very long; maybe '78 can be stretched a bit if we get an early start. As usual, I have to explain the lapse since the last Newsletter which I rushed out just prior to departing for Patuxent, Md. on 3 September to fill an urgent need for a Chief Mate on R/V Moana Wave. I remained on board for the trip to homeport Fort Lauderdale, Fl., subsequent operations in the Bahamas, and then a University of Hawaii cruise with ports of call in Puero Rico, Venezuela, and Barbados.I left the ship at Fort Lauderdale and returned home 9 December with definite plans to stay a whileto keep the home fires burning.

USS POINT LOMA (AGDS-2) visited Fort Lauderdale in October when MOANA WAVE was in port, and I was fortunate to have an hour with Kirk Newell, O-in-C TRIESTE, on board just before they sailed for San Juan and more dives in the Cayman Trough. TRIESTE had made eleven dives since transitting the Canal, the deepest going to 20,200 feet. The dive on which they had their publicized mishap wasn't really too serious, according to Kirk. The decision to terminate the dive and surface was due to fear of losing the camera package, one of its bolts having been sheared on impact with the slope they were descending.

Kirk Newell has submitted his resignation from the Navy, effective at the end of January,1978. He has not yet signed up for civilian employment; so,if you other Members have a line on an opening, please get in touch with him.

Lt. Les Parsons, USN, relieved Kirk as O-in-C TRIESTE on [illegible] January and will be applying for DSPA membership.

OCEANS 77, from all accounts, was highly successful. Unfortunately, the planned DSPA Annual Meeting there did not come off due, in part, to your Secretary not being present to organize it. I have no report of DSPA Members attendance at the symposium and would greatly appreciate comments of those present.

SECRETARY'S REPORTS & NOTICES

Dues for 1978 are now owed unless your 1977 membership card says "77-78". Dues remain at $5.00 for USA/Canada mailing addresses, $10.00 for overseas for 1978. A $5.00 increase is planned for 1979.

Members dropped from the rolls due to failure to pay 1977 dues are as follows:

Boggs Boulton Starr
Toler Vernon

Letters were received from three of the above in 1977, and it seems unlikely that they, at least, intended to forfeit membership. The Secretary will advise them that they may request reinstatement and pay a $5.00 fine or offer a statement in justification for consideration by the Board. They will not receive this Newsletter until reinstated.

Addresses- All Members please review their listed addresses and advise promptly of any corrections for inclusion in a revised list. Please don't procrastinate.

DSPA Luncheons have not been held since 13 July due to abnormal demands on the time of San Diego Members during the Secretary's absence. However, a luncheon will be held on 16 January at which time Kirk Newell will give a presentation on the results of TRIESTE Caribbean operations from May to November, 1977.

ADDRESS CHANGES

Beachler, James C. (ETCS-SS, USN)
ex- TURTLE
RES: 271 Crescent Drive
Hamilton AFB, CA 94934
BUS: USS SEAWOLF (SSN 575)
FPO, San Francisco, CA 96601

Bradley, Vance
PC-8, 1201, AMERSUB, etc.
RES: 241 Ardsley Drive
Port St. Lucie, FL 33452
BUS: INTERSUB, Ltd, Chateau Bovis
Estaque Gare, 13016
Marseille, France

REPORTS FROM MEMBERS

Ty Merritt (9/26/77)
"I received your note on dues in the last Newsletter, so am enclosing $10.00 for 77/78 dues.

"I apologize for being late. I have had a very busy schedule this year with the tethered vehicle program. I was working on RECON II in the North Sea and now have returned to the main Perry facility to take over the position of General Manager of Perry Ocean Products.

"As soon as I catch up, I will send you an update for the Newsletter."

Vance Bradley (9/24/77)
"Business first. My original address was a forwarding one used while living in England. The one above belongs to the new Bradley house in Florida. And let me tell you. The weather is much improved from Hertfordshire.

"My apologies for taking so long to express my appreciation for being elected to DSPA membership. The Association is a group I have known about for some time and I feel pretty privileged to be a part of it. I find the Newsletter to be informative and interesting, especially since my diving activities are pretty much restricted to commercial work in the North Sea and Persian Gulf.

I can understand your comments on the lack of information coming from the commercial sphere. Don't feel rained on. We all gripe about it. I have spoken to my boss about this and hope to be sending a report (Intersub approved of course) very soon. I feel like this would be interesting to you and will do my best.

"For information, our newest Mothership, Intersub Five, was put into operation last month PC-1801 on board. The vessel went to work immediately, and was still at it when last I heard. Intersub One is still in the Persian Gulf but all the other ships are operating the North Sea.

"I noticed some mis-information in the recently published MTS report as to which vehicles belong to who. So just for the record: Intersub owns and operates PC-8, PC 1201, PC 1202, PC 1204, PC 16, PC 1801, and PC 1802. Comex owns PC 1203, operating from their Mothership Protee. o3 and o4 are sister vehicles, built side by side at Perry. Intersub is growing pretty rapidly so there may well be something new to report soon.

"To change the subject entirely, does the DSPA maintain a list of current publications (books, reports, etc.,) of interest? Living in England for 2½ years has put my reading way out of date and I would be very interested in updating the library. Any help you can give me will be much appreciated."

James C. Beachler (11/8/77)
"My apologies for being so late in sending my dues. Since departing San Diego and Turtle I have been returned to the MK 1 MOD 0 U.S. Navy submarine service. I am now stationed in USS SEAWOLF SSN575. Unfortunately, I am no longer working in the Navy deep submergence program. In fact I have considered scuttling 15 years service and returning to deep submergence in a civilian status.

"My present duty doesn't allow any publicity or news. There really isn't too much that applies to deep submergence interest anyway. I want to stay associated with the DSPA as it is about the only means left of finding out about current deep submergence operations around the world. Please accept my check for past and present dues."

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Rockville, Maryland 20852

September 6, 1977

Please add my name to the Deep Submersible Pilots' Association Newsletter.

As the Science Coordinator for NOAA's Manned Undersea Science and Technology Office, I am responsible for NOAA's use of ALVIN. In addition, I have assumed Mr. Joe Vadus's duties as Manager of technology, including coordinating inter-agency shallow-water submersible cruises. Hence, my interest in submersible design, operations and techniques, and man's progress in the deep oceans.

Sincerely,

William P. Muellenhoff, Ph.D.
Science Coordinator
Manned Undersea Science and
Technology

Soundings

))) **Use of *Glomar Explorer* for Deep Sea Drilling Draws Step Nearer.** Last spring members of the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) met at the Woods Hole Oceanographic Institution. They mapped a plan for continuing the Deep Sea Drilling Project (DSDP) for the next ten years. They had reasonable assurances that efforts would be made to fund conversion of the deep ocean salvage ship *Glomar Explorer* for the mission. Now the DSDP sponsoring National Science Foundation has issued a Request for Proposal (RFP) to review existing studies (one was made by Global Marine Development Corporation, subsidiary of the company that designed and built the ship) and make recommendations concerning the feasibility of converting and operating the ship. It would be designed to operate on the ocean margins using a 3,658 meter (12,000 foot) marine riser for drilling and coring in water to that depth, and, beyond that, penetrating 6,096 meters (20,000 feet) into the earth's skin. NSF needs estimates of time and cost of mobilization, conversion and operation.

))) **Manpower in Ocean Science.** At one panel session in Los Angeles during Oceans '77 oceanographic manpower and education were discussed. Dr. Don Walsh stated that many persons educated in marine matters are looking for scarce teaching jobs at the same time jobs are open in industry. Dr. Robert B. Abel suggested that a central office for storage of data on ocean manpower be established. He said that education needs to be taken into account in any ocean policy planning.

))) **Mote Marine Laboratory to Build Marine Science Education Center.** The Mote Marine Laboratory, City Island, Sarasota, Fla., on the state's west coast, has received a $100,000 one-for-one matching grant to build a new Marine Science Education Center. The grant was awarded by the William G. Selby and Marie Selby Foundation of Sarasota. A campaign to raise the matching funds has begun. Mote's goal is to raise the money by the end of 1977. Mote began modestly, concentrating on shark research, but now is covering a much broader spectrum. High school and college groups from as far away as Iowa and New York state have visited the laboratory. The Center will offer short courses and in no way will compete with courses offered at nearby educational institutions.

Australia's Great Barrier Reef is Alive and Well. What turned out to be a non-problem which was widely publicized by ecological enthusiasts in the early 1970s, the Crown of Thorns starfish (*Acanthaster planci*) that was supposed to be devastating the Great Barrier Reef of Australia, has now been proved just that — a non-problem. Richard Kenchington, a marine biologist at James Cook University, spent the last five years studying the starfish and its effects on the reef. He discovered that only one third of the 1,250 mile long reef was affected in any way and only 50 of 1,903 reefs, 2.6%, were devastated. All of them are showing signs of regeneration, he states, adding, "The concept of an army of starfish moving down the reef leaving total destruction in its wake cannot be justified." A recent survey in one of the hardest hit areas yielded only eight starfish, whereas at the height of the infestation several hundred could be collected from a 90 meter (295 feet) section of a densely populated reef. The once strongly held theory that the harvesting of Triton shells, a starfish predator, had allowed the invasion is biologically improbable, he said.

))) **Update on U.S. Fishery Enforcement.** It was on March 1 that the U.S. Fisheries Conservation and Management Act of 1976 became effective. In the period of enforcement to Aug. 1 inside the 200 nautical mile zone there were 1,074 boardings of foreign vessels by the U.S. Coast Guard. These investigations produced 937 citations for minor infractions; 115 reports of violations (which could result in initiation of civil penalties and eventual fines of up to $25,000 per violation per vessel); and seizure of two vessels and the cargo of a third.....NOAA's National Marine Fisheries Service (NMFS) received a total of 1,348 fishing permit applications for the zone between March 1 and Aug. 1, and granted 870 of them.....Enforcement of the zone resulted in a drop of foreign vessels in the zone. This year the average has been 465 per month, while in 1976 the average was 645 for the same months, a 28% decrease.....After the example of the seizure of the vessels it appears that the countries that want to fish the zone are now willing to follow the complicated permit acquisition process and abide by the quotas levied on particular species.

U.S. Officials Seek Policy On Sea Limit

New York Times News Service

WASHINGTON — High-ranking diplomatic, defense, intelligence and environmental officials have agreed to ask President Carter to create an interagency group to work out a single, government-wide policy on this country's offshore jurisdiction.

The agreement was reached, administration sources said yesterday, at a two-hour White House meeting Friday attended by representatives of the departments of State and Defense, the intelligence agencies, the Environmental Protection Agency and other government bodies.

The meeting was called to discuss a split within the administration over plans to carry out a new law requiring that the government penalize domestic or foreign vessels that dump oil or other hazardous materials within 200 miles of the nation's coasts. The previous jurisdiction for such dumping was 12 miles.

The discussion soon spread to other issues involving jurisdiction over offshore waters, including deep-sea mining, fisheries and other problems, a participant said.

The proposed interagency group, to be coordinated by the Office of Management and Budget if approved by the President, would seek to resolve the deep differences within the administration over the nation's offshore policy and then recommend remedial legislation.

Elliot L. Richardson, U.S. special representative to the United Nations Law of the Sea Conference, wanted to block or delay enforcement of the 200-mile limit, which was an amendment to the Clean Water Act passed by Congress late last year and signed by the President.

HARMFUL TO TALKS

Richardson reportedly was joined in his opposition to enforcement of the new rule by the State and Defense departments, as well as by the intelligence agencies, which believe that enforcing the new law would have a negative impact on long-term sea law talks.

U.S. policy now views national jurisdiction to the 200-mile limit as applicable only to exploitable resources, not to navigation. Its opponents expressed concern that other nations would retaliate by restricting navigation within their 200-mile coastal zones, with possible repercussions for U.S. military and intelligence operations.

Richardson said protection of the offshore areas from dumped oil and other materials could best be accomplished through international effort rather than by unilateral action.

EPA HAD NO CHOICE

According to one administration source, representatives of the Environmental Protection Agency said Friday the agency had no choice but to carry out the intent of Congress and publish rules to carry out the enforcement of the law.

An agency official yesterday said that it was hoped that the rules would be published in a week to 10 days. He added that under the law, enforcement could not start for six months for ocean vessels and three months for fixed structures such as oil-drilling platforms.

Environmental officials agreed at Friday's meeting, however, that they would support changes in the new law to permit accommodation to international considerations.

One official said that the agency would accept a change permitting it to fine a foreign vessel for dumping between the 12- and 200-mile lines only if the vessel docked in a U.S. port afterward. Such a solution might also be worked out by the proposed task force regarding other offshore navigation.

Undersea Mining Activity Increases in Pacific Area

The pace of manganese nodule mining in the Pacific Ocean will accelerate soon, as the drillship *Sedco 445* soon will be converted to a deep sea mining vessel at Bethlehem Steel's Beaumont, Tex., yard. The unit went into the Bethlehem yard in October and will head for the Pacific in early 1978.

A consortium called Ocean Management, Inc., will be operators of the venture. The group includes SEDCO, Dallas, Tex.; INCO Ltd., the world's largest nickel mining and processing concern, Port Colbourne, Canada; the AMR Group, West Germany; and DOMCO, a group of 23 Japanese companies with expertise in processing, construction and exploration.

After the 30-40 day conversion, the unit is scheduled to begin working in February 1978 in 15,000-ft. waters in an area of the Pacific between the Hawaiian Islands and lower California. Engineers expect to harvest some 5,000 tons of nodules during the test lasting from 120 to 150 days at sea. Nodules will be offloaded every 30 days when the vessel returns to shore for new crew and supplies, then will be sent to INCO's plant in Port Colbourne, Canada.

Meanwhile, other consortiums are continuing their deepsea testing programs, waiting for legislation to be passed in the U.S. setting up procedures for exploitation of the ocean's mineral wealth. Deep Sea Ventures, Gloucester Point, Va., and Kennecott Copper, New York, N.Y., are two groups heavily engaged in the mining activities.

Drilling Off U.S. East Coast To Begin By End Of This Year

Interior Department Secretary Cecil Andrus reports the first drilling off the U.S. East Coast may begin as early as December of this year. Andrus has started issuing exploratory drilling permits while the Environmental Protection Agency is processing applications for discharges. As soon as the oil companies secure the permits, oil drilling rigs will be moved into the area.

LAW OF THE SEA UNDETERMINED. The United Nations Conference on the Law of the Sea has broken up - this time after two months of inconclusive talks where the U.S. again finds itself at odds with much of the Third World. The conference will reconvene in Geneva in March 1978. The main disputed point in the conference has to do with the mining of the oceans' rich mineral deposits in nodules of manganese, copper, nickel, and cobalt.

> AFTER FIVE YEARS of conferring, a draft treaty text has been distributed. Although the American chief delegate to the conference, Elliot Richardson, admits some progress, he cites that the draft fails to assure that both private (or state) companies and an international authority would be able to mine the seabed. He feels it sets arbitrary limits on private mining, imposes stiff obligations and financial burdens on private firms, and gives too much power to the international body which could gain a mining monopoly after 25 years.

THE UNITED STATES, for example, is an importer of nickel, and would like very much to start mining the seabed. It has the technology and the financing to do the job. To do so outside the U.N. would undermine the conference effort; however, chances of reconciling the differences outlined by the have-nots in the draft treaty and the haves, as outlined by the U.S. position, appear remote.

Administration's Law of the Sea Positions Stated By Richardson

For the first time since coming into office the Carter administration has definitized its positions on a number of controversial items plaguing the Law of the Sea Conferences (LOSC). Ambassador Elliot Richardson, head of the U.S. LOSC delegation laid them out Oct. 4 before a joint hearing of the Subcommittee on Public Lands and Resources of the Senate Committee on Energy and Natural Resources and the Senate Committee on Commerce, Science and Transportation.

Richardson stated that if there is to be any meaning to the Common Heritage of Mankind, those with the technology and resources to make that heritage a reality must move forward. He spelled out the positions by saying that legislation:

- should be interim in nature, providing for its own supersession by a treaty;
- should contain provisions for harmonizing U.S. regulations with those of reciprocating states so as to avoid conflict;
- should provide for environmental protection, sound resource management, and protection of life and property at sea;
- should provide that seabed mining by U.S. companies produce financial benefits for the international community;
- should address the exploratory stage of deep seabed mining in detail but treat most generally the framework for a regulatory regime for exploitation, with the date for entry into force of such a regime left open;
- should not be specific with regard to the assignment or allocation of mining sites for exploitation;
- should not require that processing plants be located in the U.S.;
- should not offer U.S. mining companies financial protection against adverse effects of a trzaty concluded subsequent to the passage of legislation and expenditures by those companies; and
- should assure that all provisions of the legislation leave undisturbed the concept of high seas freedoms.

Richardson also stated that he favors dealing only with deep seabed mineral exploration matters in detail at this point, leaving detailed discussions on exploitation until later.

On the matter of investment guarantees against injury suffered by virtue of entry into force with respect of an international agreement, Richardson said that the administration firmly opposes such a provision, which figures prominently in Senate bills S.2053 and S.2085.

He said, "It is my judgment that the Spring 1978 session of the Conference — if indeed we get that far — will reveal finally whether a comprehensive treaty has a future. If not, industry will have nothing to fear from that quarter. If progress does indicate that agreement is within reach, industry will be able to judge for itself from the texts the prospects for economically attractive ventures. Seabed mining is, after all, not just around the corner. Nor are our pipelines and stockpiles of the minerals involved issues for time-related concern. In short, the purported need for investment guarantees seems related neither to timing nor to national resource problems.

"Secondly, I question the very concept of indemnifying U.S. citizens against losses incurred as a consequence of an international agreement that both the President and the Senate believe to be in the overall national interest. I have considerable difficulty as well in reconciling the notion of guarantees for seabed miners with the denial to higher priority sectors — e.g., energy — of such protections."

Capital Report

hearings • legislation • departments • agencies

Frank Reorganizes NOAA; Splits International Meeting Duties

After revealing his plan to reorganize the National Oceanic and Atmospheric Administration (NOAA), Richard A. Frank, who became administrator July 16, told a Washington luncheon group that oceanic matters should receive added emphasis.

He spoke before a combined meeting of the American Oceanic Organization, the Ocean Policy Forum sponsored by the Center for Oceans Law and Policy of the University of Virginia and the Washington Section of the Marine Technology Society.

Frank reinforced the stature of the so-called Stratton report, in reality the four volume study entitled "Our Nation and the Sea," put together by the Commission on Marine Science, Engineering and Resources and published in January, 1969. However, the Commission's work preceded that date by two years. Dr. Julius Stratton headed the Commission. He cited many other studies and reports that have appeared since then, branding them simply revisions of the Stratton report.

The reorganization plan involved a scrambling and re-sorting of functions including dismemberment of the living and non-living resources organization under one associate administrator.

At the uppermost levels there is little change. There had been a deputy administrator and an associate administrator reporting directly to the administrator, with the deputy being number two and the associate number three. Now Frank, holding an executive level III position, will have the two coequal executive level IV positions reporting directly to him.

The reorganization plan has been submitted to the appropriations committees of both houses of Congress. If not objected to it was scheduled to go into effect Oct. 1.

But below the two top levels there are five assistant administrators at executive level V plus the General Counsel at the same level. They are:

• Fisheries. This will include the present National Marine Fisheries Service (NMFS) and the Office of Marine Mammals. Whether NMFS will retain its present character hasn't been determined. Asked whether the regional fisheries councils formed last year would be subjected to greater central control, Frank said that they need support from Washington, but that NOAA would not intrude. Reflecting his conservationist background, he said that mammal protection in the organization had been too low and will now be upgraded. Fisheries will have 2,279 employees and a budget of $80 million.

• Coastal Zone Management. This has been an associate administrator job and will be downgraded. Frank said that as states implement their zone plans CZM's role will diminish, other responsibilities will be given to i With 100 employees its budget is $153 million.

• Research and Development. This new entity will include the Environmental Research Laboratories, mainly concentrated in Boulder, Colo., Seattle, Wash., and Miami, Fla., and the Office of Sea Grant and the new Office of Ocean Engineering. The last includes the Manned Undersea Science and Technology (MUS&T) program, which at the present stage of Congressional appropriations stands to receive $1.5 million as its basic funding, up a little more than $500,000 and $3.75 million for the **Oceanlab** mobile undersea habitat program. R&D will have 1,359 people and a budget of $115 million.

• Oceanic and Atmospheric Services. This assistant administrator's office gathers together the National Weather Service, National Environmental Satellite Service, National Ocean Survey and the Environmental Data Service. It will have by far the greater number of employees, 9,288, and the biggest portion of the $802 million NOAA budget, $385 million.

• Policy and Planning. Frank said that this was a necessary move because NOAA in the past has not had a formal office for this function. An anomaly is that the Ocean Minerals office will be attached here, reflecting the confusion over the breakup of marine resources responsibilities.

• Administration. This will be a GS-17 job rather than level V.

Reporting directly to the top levels

Unlike previous years when the information was made available sometime February and April, the breakdown of federal budget spending in the oceans wasn't released until recently. Here are the tables. Figures may not add exactly due to rounding.

FEDERAL OCEAN PROGRAM
AGENCY BUDGETS
(In millions of dollars)

	FY-1976	TQ	FY-1977	FY-1978
Department of Defense — Military	195.5	52.3	242.6	243.7
Department of Defense — Civil Works	29.2	7.1	32.1	63.8
Department of Commerce	235.2	66.5	274.2	315.9
National Science Foundation	68.8	15.8	74.8	79.9
Department of Transportation	36.4	9.3	46.6	49.1
Department of Interior	142.0	37.5	153.8	161.7
Environmental Protection Agency	24.3	6.1	25.1	22.7
Department of State	12.7	5.9	14.9	18.2
Department of Health, Education & Welfare	16.4	2.8	17.3	18.0
Energy Research and Development Admin.	18.9	6.2	28.9	49.3
National Aeronautics and Space Admin.	20.9	8.0	30.2	18.5
Smithsonian Institution	2.6	0.7	2.8	2.9
Total	802.9	218.2	943.3	1044.3

FEDERAL OCEAN PROGRAM
MAJOR PURPOSE CATEGORIES
(In millions of dollars)

	FY-1976	TQ	FY-1977	FY-1978
International Cooperation and Collaboration	12.7	5.9	14.9	18.2
National Security	81.8	21.6	99.6	94.4
Living Resources	87.6	20.4	106.4	114.4
Transportation	31.9	6.2	38.1	47.0
Development and Conservation of the Coastal Zone	124.8	31.1	133.4	188.3
Non-Living Resources	121.2	31.9	131.4	140.5
Oceanographic Research	129.3	37.7	146.4	158.4
Education	10.5	4.7	12.6	14.2
Environmental Observation & Prediction	40.0	11.4	47.8	46.6
Ocean Exploration, Mapping, Charting and Geodesy	87.7	22.4	111.4	111.9
General Purpose Ocean Engineering	62.6	20.0	86.5	98.4
National Centers and Facilities	12.8	4.9	14.8	14.0
Total	**802.9**	**218.2**	**943.3**	**1044.3**

will be: Congressional Liaison, GS-16; Public Affairs, GS-15; Naval deputy, flag rank; NOAA Corps, flag rank; Ocean Management, GS-18; and Budget and Program Evaluation, GS-17.

Frank stated repeatedly increased emphasis on ocean affairs. He stated that the oceanographic laboratories haven't been utilized to the fullest extent and that there has been too much emphasis on the atmosphere, reflecting the long heard theme of Sen. Ernest F. Hollings, chairman of the National Ocean Policy Study. Ocean Management will perform the wet equivalent for NOAA that land use planning is doing for Interior.

NOAA will become active again in weather modification, using Lockheed C-130 aircraft. Initial areas of hurricane seeding will be in the Atlantic, and, with Mexico on a joint basis, the Pacific where more hurricanes originating off the west Coast of Mexico have gone inland from the Gulf of Baja, California rather than churning northwest into the open ocean.

Frank said that the agency had never before had a policy and planning office. When the parent Department of Commerce was asked to prepare a national ocean policy study by President Jimmy Carter last June Frank said that the Commerce Assistant Secretary for Policy had to set up the machinery (with plenty of help from NOAA).

NOAA's policy and planning shop will have scientists in it — plus economists and lawyers. He decried scientists in academia who have student research assistants to perform their work who come in on National Academy of Science Committees and complain about what NOAA does rather than telling how NOAA can do things better.

New observation system promises to improve the usefulness of conventional diving bells, according to International Underwater Contractors (IUC). Consisting of a transparent acrylic door with a steel ring frame designed to be mounted on the standard outer door flange of a conventional diving bell, the system gives the observer a panoramic view. Combined with an externally mounted hydraulic package and one or two manipulators such as IUC's remote controlled arm, MK II, an observer inside the bell can perform useful work or obtain bottom samples as required. The portability and design of the system allows it to be interchanged with the standard door on any conventional bell when required. IUC plans to build and test units with manipulators for observations and work down to 1,500 ft.

Referring to the new assistant administrator for research and development, Frank noted that NOAA never had one before. There simply was an acting one in Boulder, Colo.

He gave credit to Dr. Thomas Austin for creating the germ of ocean management in the Environmental Data Service. Now, he said, ocean management will perform for the oceans what land use planning has done in the Department of the Interior. It will be one place in NOAA where a program will be looked at and a determination made as to whether it is sensible or not. It will not dictate to other departments and agencies but it will scrutinize and criticize.

As for overall governmental restructuring, Frank said that there are many checks and balances to consider. There is one fundamental issue. Two approaches to reorganization have been suggested. One is functional, where the ocean is divided in parts, perhaps spreading it through agriculture, natural resources, environment and others. The other way of going, he said, is the way NOAA is heading, and that is where the environment and the interactions are closely related to each other.

In fisheries he won't change the character of the industry. He believes in individual boat owners. He is not sure that the industry will need help, just some startup money, because it is very innovative.

In mentioning ocean engineering Frank noted that the last Coast Guard cutter ocean station has been replaced by the buoy.

In international affairs the assistant administrators will have the responsibilities. For instance, the assistant for oceanic and atmospheric services will cover activities of the World Meteorological Organization. "Almost all we do has something to do with international affairs," he declared. "I talked with somebody in industry. He said, 'There is a paucity of help in terms of promotion and marketing. You are spending too much time gathering data.'"

Reflecting his ecology background, Frank said that marine mammal matters will be upgraded to the level where the office will report directly to the assistant administrator for Fisheries.

Multi-Purpose COMEX Vessel Begins N. Sea Diving Support

The *M.V. Talisman*, one of the most sophisticated multi-purpose underwater construction and engineering diving support vessels built for offshore operations, has arrived in the North Sea and has undertaken a wide range of diving services. The vessel, operated by Comex Diving, Marseilles, France, has started work on tie-ins of the Statfjord field's Condeep platform, then was expected to move into the Dutch Sector of the North Sea to carry out underwater connections and testing by midfall.

The vessel's diving equipment is capable of supporting saturation diving to 1,000 ft. with 20-hours-a-day bottom time and in addition, can provide in 1978 a hyperbaric welding system, a submarine for work including inspection and observation and various other diving related functions. The *Talisman*'s compactness in size means it has the unique ability to provide a fast and varied diving support on any offshore location and in the worst weather conditions. There is accommodation on board for 80 persons, a deck crane, helideck and a fully equipped workshop for fast on-site maintenance.

Aberdeen Facility Opened By Helle Engineering

Helle Engineering, manufacturers of subsea communication and instrument systems, has opened a new facility and has started overseas manufacturing operations in Aberdeen, Scotland.

Helle Engineering Ltd., the new production facility, will manufacture, sell and service over 50 different marine related products. These include underwater communications systems, call buoys, instrument retrieval systems, acoustic tracking and relocation systems, pingers, wire diver phones and helium unscramblers.

In addition, Helle Engineering Ltd. has been named exclusive distributor for the Scubapro U.K. Ltd. complete line of commercial diving equipment which includes tanks, regulators, fins, depth gauges and a variety of accessories.

Place Goals Before Policy

Dr. Spilhaus, raconteur and man for all seasons, was originator of the idea of the Sea Grant Program. (See ST for December, 1976, page 7, for details on him.) At present he is a special consultant to the Administrator, National Oceanic and Atmospheric Administration.

ST SOAPBOX

by Dr. Athelstan Spilhaus

There has been a lot of talk about national ocean policy in Congress and the Executive Branch. How can you write a policy when you don't have a goal in the oceans? There is no natural goal in the oceans. You have to find a goal. If a goal could be defined then we would have to create a policy to reach that goal.

One of the things that is always important to remember in ocean matters was the parallel in the space business when President Kennedy for reasons that were pretty good at the time defined the idea of getting to the moon.

Now this is not an important goal; not nearly as important as utilizing the oceans. And yet by golly, by defining a goal, putting a time scale on it we set up a policy in space. We constructed it. It was in the early part of this business. I announced the United States entry into space from the White House lawn in the summer of '55.

Because we announced a goal we then set up and transformed the National Advisory Committee for Aeronautics (NACA) into the National Aeronautics and Space Administration (NASA). We defined a policy in space, we organized management teams from sources in industry and by God we got to the moon. We achieved that goal, unimportant though it might be compared to a goal in the oceans.

Current ocean policy studies are putting the carter before the horse. How can you handle all of these policy studies when you don't know what you are going to do in the oceans? And then a natural question you should ask is, "OK Spilly, what is your idea of what to do in the oceans?"

My idea of a goal of the United States in the oceans is the proper use of the oceans for the benefit of our people in the U.S. and others, peripherally, because if we benefit ourselves we will benefit other nations; proper exploitation of the oceans; stewardship of the oceans with a view to productivity. That is the broadest aim we can state. This means encourage business exploitation of the oceans and regulate as regulations are needed and don't again, put the cart before the horse and bring in regulations about deep sea mining before we even know we can mine the deep sea. This destroys the entrepreneurship of the people who are risking a hell of a lot of money to do something completely new.

You cannot chance it to write an environmental impact statement (EIS) on something that has never been done before. I'm all for EISs on powerplants where we know the technology and just what it will do. That's a fine thing if you build another duplicate powerplant. By all means see what impact it will have on the environment. But when you are doing something that is highly costly, that is adventurous, that is in the American spirit of experiment, you can't ask to say what it is going to do to the environment.

Now, a typical example is deep sea mining. They are putting all kinds of restrictions on the people who are going to mine the nodules. The Deep Ocean Environmental Survey (DOMES) is absolutely ridiculous because even if mining the deep Pacific caused "pollution" in the ocean, which we don't know it would do, the Pacific is so big you would have to do one hell of a lot of mining before you would have any effect at all.

On the other hand bringing up the detritus from the bottom of the ocean with the nodules might fertilize those parts of the Pacific Ocean which are essentially oceanic deserts. It is plowing the ocean. And beside this, the plowing of the ocean might be a more important natural result than the nodules themselves. We might get a byproduct from them. It is this entrepreneurial optimistic productive attitude I urge the U.S. to incorporate in its goal in the oceans.

As for our merchant marine, what do we do with it? How do we use it?

I'm not going to talk about American flag carriers. I want to look at the whole thing. I went to the U.S. Merchant Marine when it was in trouble years back, in the Eisenhower days. We had a great discussion in Congress about building a nuclear ship to show the new technology. What should it be? Nelson Rockefeller was an assistant to Eisenhower and I went to Nelson and suggested that the way to show the nuclear flag in a peaceful constructive way to other nations would be to construct a long legged oceanographic research vessel that could go anywhere in the interest of scientific research. Well, it wasn't done. It would have been a hell of a good idea.

Instead, it was the *Savannah*. The *Savannah* was a ridiculous idea and I'm not talking in hindsight because I went up to the hill and I said, "Look, the problem with passenger carrying vessels is not the powerplant. The problem is the labor laws that insist that you shove the three meals into an eight hour day or carry a duplicate crew.

Now I have nothing against the fact that our labor unions demand better standards of pay and living for our people who go to sea. And in the U.S. we are continually elevating people by this way. Nothing against that. But, in an effort to cure the competitive problem with foreign passenger carriers they put in a nuclear powerplant within the *Savannah*.

With a nuclear powerplant you don't cure the labor law problem by putting in a different kind of a powerplant. And so the whole thing went down the drain. The ship got mothballed. ⟶

We try to correct things that require social fixes with technological fixes and we try to cure technological disasters with social fixes. But social fixes are also needed. They're important.

When the civilian space program got started they created a dichotomy between what is nice peaceful space and the military one which was dirty and nasty. It is the temper of the country to look on the military as dirty and nasty. I do not share this view. I think the cleanest and most important thing you can do for people in the U.S. is let them be assured that we have a strong military that act and protect and defend if necessary. It is just a current heritage of that nasty war we had in Vietnam. It is the heritage of that that gave the stigma against our military. Our Navy is being eroded. It is a good Navy but we don't use it.

What I am worried about is the increasing necessity for the government to expand its regulations based on scientific and technological knowledge.

I am an environmentalist, but I believe that clean-up should come about on a scientific and technological basis. Now, we have many examples of executive agencies which depend on scientific and engineering profiles. And yet they are not depending on their scientists and engineers in government who often respond because they have been browbeaten to respond to their bosses because they know what the policy is the government would like to have, bolstered by scientific evidence.

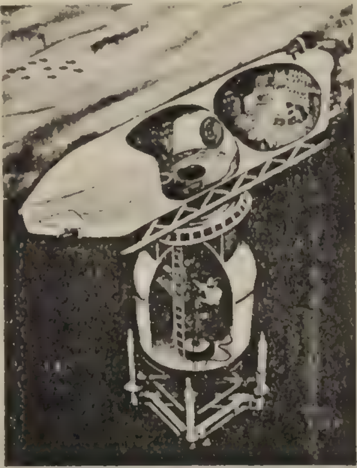
I may use the phrase that their comfortable way of operating is to allow the evidence to rise to the graviche (lack of gravitation-Ed.). I think this is a shattering thing that there are so few people who will speak out, who are in somebody's bag. ▶

Extending subsea missions in toxic atmospheres

Diver's Exchange, Inc., (DIVEX) has been awarded a contract to deliver a series of life support systems for Lockheed Petroleum Services, Ltd. (LPS). These systems will be installed in the three LPS Service Capsules and in an experimental service system based on the use of contracted submersible. Each of these life support units is subdivided into Work Breathing (WBS) and Emergency Breathing (EBS) Systems. This advanced project is highlighted by low weight, low volume and added safety through high technology according to Divex' President, George Sampson.

The LPS service system is used to transport offshore oil field technicians and their gear to subsea production chambers, all at normal air pressure and in a "shirt sleeve" environment. LPS has installed a number of these chambers in the Gulf of Mexico, the North Sea and soon in Brazilian waters as well. LPS technicians normally do their subsea work in a controlled, comfortable, non-diver type environment. The system is designed, however, to allow them to continue their work if the atmosphere should become contaminated. The technicians then activate the WBS. As third level of safety, the EBS was designed to sustain the subsea crewmen for 72 hours beyond mission length in a toxic atmosphere.

The DIVEX WBS is based on supply and return air sources which "push-pull" air through flexible hoses to the four technicians. Each technician is fitted with a DIVEX modified AGA mask and special exhaust control valve to enhance face seals. The supply and exhaust air source for the capsule system is the capsule's umbilical but DIVEX devised compressors and vacuum pumps in automatically redundant sets are used in the submersible's system. The WBS provides several safety features which minimize oxygen leakage into the inerted atmosphere of the subsea chamber so that explosion hazards are eliminated. The technicians wear lightweight "come home" air cylinders and regulators to ensure safe egress in the event of WBS failure.



Overall view of Lockheed service capsule mated to a submersible.

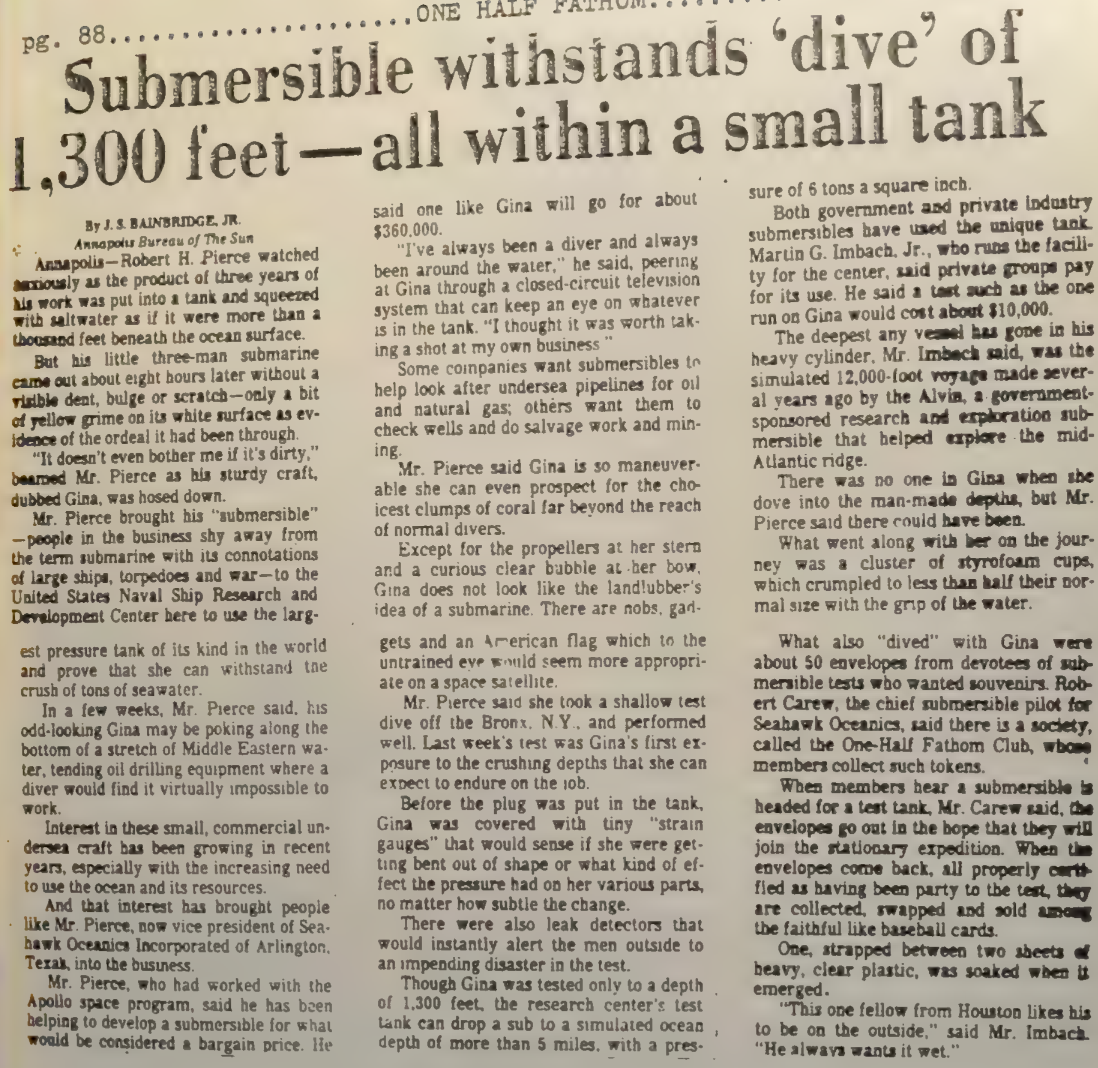
If return to the surface is delayed for any reason, the EBS provides up to 72 hours of reserve life support for four men. This system, as in the submersible's WBS, is of closed-circuit, sensor controlled, double redundant design. The DIVEX EBS design augments the primary and secondary WBS life support of both the capsule and submersible service systems, and utilizes the same dual purpose AGA masks of the WBS.

LPS normal work cycle is 12 hours per dive, but can be extended considerably if the situation warrants it. Therefore, DIVEX engineers have incorporated means of providing water and semi-liquid food through the technicians' masks. Communications are also provided within the masks.

This two hundred thousand dollar DIVEX effort includes design, fabrication, test and installation by October of 1977. Total near term contracts are expected to approach a half million dollars. ✔

Working inside platform jackets

General Diving and Salvage Co. designed an autonomous submersible—*Sat Sub I*—with clamps for attaching the unit to a brace of a steel platform jacket. A diving bell attached to the submersible could then be extended into the interior of the jacket so divers could perform maintenance. The system requires no surface support, thus allowing its use in any kind of weather. (*Ocean Industry*, June 1977).



Submersible withstands 'dive' of 1,300 feet—all within a small tank

By J. S. BAINBRIDGE, JR.
Annapolis Bureau of The Sun

Annapolis—Robert H. Pierce watched anxiously as the product of three years of his work was put into a tank and squeezed with saltwater as if it were more than a thousand feet beneath the ocean surface.

But his little three-man submarine came out about eight hours later without a visible dent, bulge or scratch—only a bit of yellow grime on its white surface as evidence of the ordeal it had been through.

"It doesn't even bother me if it's dirty," beamed Mr. Pierce as his sturdy craft, dubbed Gina, was hosed down.

Mr. Pierce brought his "submersible"—people in the business shy away from the term submarine with its connotations of large ships, torpedoes and war—to the United States Naval Ship Research and Development Center here to use the largest pressure tank of its kind in the world and prove that she can withstand the crush of tons of seawater.

In a few weeks, Mr. Pierce said, his odd-looking Gina may be poking along the bottom of a stretch of Middle Eastern water, tending oil drilling equipment where a diver would find it virtually impossible to work.

Interest in these small, commercial undersea craft has been growing in recent years, especially with the increasing need to use the ocean and its resources.

And that interest has brought people like Mr. Pierce, now vice president of Seahawk Oceanics Incorporated of Arlington, Texas, into the business.

Mr. Pierce, who had worked with the Apollo space program, said he has been helping to develop a submersible for what would be considered a bargain price. He said one like Gina will go for about $360,000.

"I've always been a diver and always been around the water," he said, peering at Gina through a closed-circuit television system that can keep an eye on whatever is in the tank. "I thought it was worth taking a shot at my own business."

Some companies want submersibles to help look after undersea pipelines for oil and natural gas; others want them to check wells and do salvage work and mining.

Mr. Pierce said Gina is so maneuverable she can even prospect for the choicest clumps of coral far beyond the reach of normal divers.

Except for the propellers at her stern and a curious clear bubble at her bow, Gina does not look like the landlubber's idea of a submarine. There are nobs, gadgets and an American flag which to the untrained eye would seem more appropriate on a space satellite.

Mr. Pierce said she took a shallow test dive off the Bronx, N.Y., and performed well. Last week's test was Gina's first exposure to the crushing depths that she can expect to endure on the job.

Before the plug was put in the tank, Gina was covered with tiny "strain gauges" that would sense if she were getting bent out of shape or what kind of effect the pressure had on her various parts, no matter how subtle the change.

There were also leak detectors that would instantly alert the men outside to an impending disaster in the test.

Though Gina was tested only to a depth of 1,300 feet, the research center's test tank can drop a sub to a simulated ocean depth of more than 5 miles, with a pressure of 6 tons a square inch.

Both government and private industry submersibles have used the unique tank. Martin G. Imbach, Jr., who runs the facility for the center, said private groups pay for its use. He said a test such as the one run on Gina would cost about $10,000.

The deepest any vessel has gone in his heavy cylinder, Mr. Imbach said, was the simulated 12,000-foot voyage made several years ago by the Alvin, a government-sponsored research and exploration submersible that helped explore the mid-Atlantic ridge.

There was no one in Gina when she dove into the man-made depths, but Mr. Pierce said there could have been.

What went along with her on the journey was a cluster of styrofoam cups, which crumpled to less than half their normal size with the grip of the water.

What also "dived" with Gina were about 50 envelopes from devotees of submersible tests who wanted souvenirs. Robert Carew, the chief submersible pilot for Seahawk Oceanics, said there is a society, called the One-Half Fathom Club, whose members collect such tokens.

When members hear a submersible is headed for a test tank, Mr. Carew said, the envelopes go out in the hope that they will join the stationary expedition. When the envelopes come back, all properly certified as having been party to the test, they are collected, swapped and sold among the faithful like baseball cards.

One, strapped between two sheets of heavy, clear plastic, was soaked when it emerged.

"This one fellow from Houston likes his to be on the outside," said Mr. Imbach. "He always wants it wet."

Scientists at Woods Hole Oceanographic Institution (WHOI) are considering an expedition to locate and photograph the wreckage of the TITANIC, which sank in 1912 on its maiden voyage. The 243' ALCOA SEAPROBE is currently being considered as the main expedition ship. It would carry about 30 crewmen plus 20 scientists. The ship at present can only make photographs down to 10,000' and the TITANIC is believed to be in 12,000' of water. Therefore the ship would have to be modified to permit photography at the greater depth.

Perry Oceanographics newsletter Perry Scope states that Perry's newest diver lockout submarine, the PC 1803, is nearing completion and was due for sea trials in Sept. This submersible is contracted to Superpesa Transportes Maritomos Ltda, Rio de Janeiro, Brazil.

Construction is continuing on PC 1205, an observation workboat submarine, and the PC 1804, a diver lockout sub.

1977

PISCES IV

In August, PISCES IV was flown to Resolute Bay in the Northwest Territories in a Canadian Forces Hercules and then transshipped via barge to HMCS PRESERVER. While in the Arctic PISCES IV made a series of dives in support of various projects of the Defense Research Establishment Pacific and then was flown back to Pat Bay. The Canadian Forces' submersible SDL-1 was also on the HMCS PRESERVER, so there was a rare opportunity for an exchange of information and ideas on submersibles and operating them. In fact, the main reason PISCES IV was there at all was to be readily available in case SDL-1 had difficulty during her diving program, but PISCES IV ended up doing a share of the work also.

Since returning from the Arctic things have been very quiet. We have completed the refit work interrupted by the Arctic excursion and are now in the process of having all the syntactic foam on the submersible replaced. This work is being done at HYCO in North Vancouver, and will hopefully be completed about the middle of December. By January we should be ready to get back into our normal operating routine."

PISCES VI was very much in the news for dives made off the Farallon Islands at the site of a nuclear waste dump area. This area was used to dump 55 gallon drums of nuclear waste between 1946 and 1965. The Environmental Protection Agency used the sub to make detailed observations on the condition of the radioactive containers which are under 3,000' of water 30 miles west of San Francisco.

One of the drums of atomic waste was recovered by the PISCES VI and the surface vessel VELERO IV. However, this recovery was up-staged by the loss of a giant sponge which the sub was trying to bring up. These four foot tall sponges were discovered thriving among the waste drums and scientists were anxious to examine one. The claw on the sub held the sponge all the way up 3,000' but the moderately heavy seas proved too much and the sponge broke away. There were too many sharks in the area so divers were not sent in after the sponge. Those present agreed that it was probably eaten by the sharks after it tore loose.

Al Witcombe writes that PISCES VI has now returned to HYCO from these dives and has been put back into storage. No more dives are anticipated for this sub for awhile.

The drum that PISCES VI brought up was estimated to be between 600 and 800 pounds in the water, so the fact that this amount of weight was recovered from so deep by a submersible is believed to be a first. At that depth they were unable to use air to augment their payload condition and had to rely on disposaled means .. ie: drop weights and water ballast.

Their support ship for the dive series was the PANDORA II, which usually works with the PISCES IV. Al writes his special thanks to the PANDORA II and her crew saying it was good to work with them again.

Last month I reprinted a squib from the DSPA newsletter in which I quoted that the Texas A&M sub DIAPHUS was up for sale. Now there is an article in Sea Technology which states that the sub and mother ship R/V GYRE might be used in the Red Sea early next year for research on various aspects of biological, geological, and chemical oceanography in the northern part of that body of water. The oceanographers also hope to expand their research effort to include most of the Red Sea and the Arabian Gulf in a program of 5 years or more.

We had letters this month from both our good friends with ALVIN, Ed Bland and Larry Shumaker. They both told of ALVIN being in overhaul now and being fitted with an entirely new external frame work made of titanium. When they put back to sea, hopefully by March 1, 1978, ALVIN will be 2 feet longer, somewhat blockier in appearance and have a slight increase in power and payload.

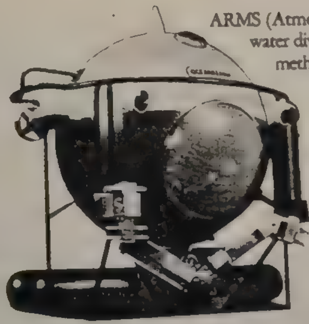
Larry also notes that during the recent TRIESTE operations in the Cayman Trench and the North Atlantic in September, TRIESTE was navigated using the ALVIN Navigation System operated by members of the ALVIN group.

Larry also participated in the EPA PISCES VI dives at Farallon Islands.

Ed Bland states that the pilot on board ALVIN during the "monster" sighting back in 1965 or 1966 really did see "something" out of the ordinary.There is still no explanation of what it was. Ed also says that ALVIN's rate of descent and ascent averages about 30 meters a minute, about 100'. So it would take 2 hours to get down to 12,000'. Re: ladies bathroon facilities on ALVIN. Sorry, gals but we're out of luck as there aren't any. All the ladies diving in ALVIN so far have been endowed with amazing "holding capacity".

After the current dive series ALVIN will go into an extensive 4 month overhaul to get a new titanium frame with some new foam and skin sections. They hope to commence diving again in February. So Ed says, "No more covers until after the 1st of the year."

ALVIN will probably have a total of 100 or more dives for 1977 with the average dive being about 6½ hours and the average depth in excess of 7000'. We'll know for sure on the statistics after the dives for 1977 are concluded and Ed compiles it all.



ARMS (Atmospheric Roving Manipulator System), our new deep-water diving system, is one example of how we explore new methods of handling tough subsea problems.

ARMS is a two-man, one atmosphere, self-propelled 3,000-foot tethered bell with an advanced force feedback manipulator system developed by GE.

It can start a nut, stab guidewires, turn valve handles or feel a gap like a human.

It can even locate, grasp, and perform tasks with pins, cables or other hardware in zero visibility.

It is currently under contract for use in exploratory drilling.

Oceanology Int.

AMETEK, Ocean Systems Join To Test Unmanned Vehicle

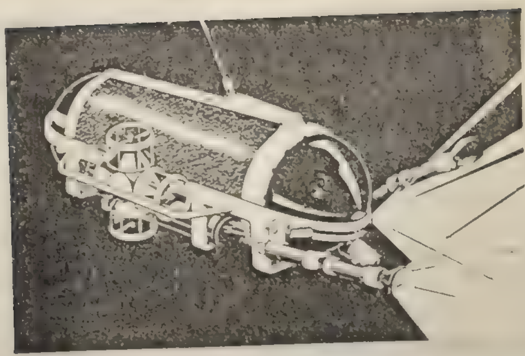
One Sept. 1, AMETEK, Straza Division, El Cajon, Cal., and Ocean Systems, Inc., Houston, Tex., joined for sea trials and operator training of the AMETEK unmanned vehicle system SCORPIO. Sea trials were conducted offshore Santa Barbara, Cal., from Ocean Systems' derrick barge *D/B Samson*, in water depths from 200 to 2,100 ft.

One of the highlights of the operations was the connecting of a ⅜" wire cable from the surface to a small underwater target in 1,267 FSW. In this operation, the ⅜" cable was first connected to a snap hook held by SCORPIO's tether cable and hauled to depth. The initial search depth was 1,350 feet.

Based on its locator and sonar data, SCORPIO was maneuvered to the target, a concrete clump, and the hook was snapped onto a padeye attached to the clump. SCORPIO was then directed away from the clump, forcing the wire to separate from the tether cable. SCORPIO and the concrete clump were recovered separately. This is believed to be the first demonstration of its kind using a commercial unmanned vehicle to make a heavy recovery cable connection in excess of 1,000 feet.

Wharton Williams orders two *WASP* submersibles

Wharton Williams Ltd, Aberdeen, has ordered two *WASP* submersibles, handling systems, TV camera and maintenance service from the *OSEL Group*, Great Yarmouth, England. The total contract agreement amounts to $425,000. WASP is a one-man atmospheric self-propelled submersible suit designed for water depths to 2,000 ft. Articulated arms can be fitted with non-destructive testing equipment, power tools.



One-man atmospheric sub

The **OSEL Group** has developed a one-man atmospheric submersible for underwater operations to depths of 610 m. The submersible—*Mantis*—is equipped with manipulators that can be fitted with a variety of tools for maintenance, repair and inspection of marine structures. In addition, the vehicle can be used in rescue and recovery work.

The prototype is expected to be ready for trials in April 1978.

Payload increased with glass-reinforced plastic submersibles

The first glass-reinforced plastic submersible—*LR2*—is operating in the North Sea for Vickers Oceanics. The second such craft, *LR3*, was delivered while a third submersible, *LR4*, is under construction for Fred Olsen Oceanics A/S, a 50/50 venture of Vickers Oceanics.

Vickers Oceanics' associate company Vickers-Slingsby began building the submersibles after an extensive research program which started in May 1972. The initial 12-month investigation involved many areas, including fatigue life of GRP at various depths; impact resistance with the submersible operating in a hostile environment near the seabed; methods of outside and internal attachment of fittings and equipment, and means of providing penetration for the acrylic viewports, conning tower, electrical and hydraulic cables and pipes through the hull. Scale model hulls were tested to obtain design criteria.

Vickers-Slingsby realized that one disadvantage of GRP against steel was a three-to-one ratio increase in design costs. However, GRP has the following advantages: more readily available; much higher carrying and working payload—a key factor; noncorrosive; life expectancy of 10-15 years, and superior thermal properties. Less condensation and greater warmth means a better crew environment.

There is no marked cost advantage or disadvantage between GRP and steel hulls. *LR2* cost about £500,000.

Vickers set out five years ago to improve on the submersible's payload of 400 lb. This it achieved. *LR2* has a payload of 2,000 lb and the *LR3*, 3,000 lb. The GRP submersible is thus able to take on board increased battery power, giving more endurance and hydraulic power for tools. These are used from the nose of the craft, operated by the two-man crew via manipulators from the control cabin.

LR2 was designed specifically to meet Lloyd's Register of Shipping standards for Class 100/A submersibles. The design of *LR3* is an advance, enabling it to have an extra 300-ft operating depth down to 1,500 ft. *LR3* is 21 ft, 4 in. long with a 9-ft, 3-in. beam and 7-ft, 8-in. height. Underwater power is 2.5 knots.

LR3 and *LR4* will be able to operate anywhere off the British and European mainland coasts. This includes exceptional areas such as the Irish Sea, which has a depth off Cork of 1,350 ft, and the Norwegian trench with a maximum seabed depth of 1,600 ft, although some chasms plunge to 1,728 ft. *LR2* has already completed 200 dives to 660 ft during a program of seabed investigation and rig foundation clearance work on the Brent oilfield in the North Sea.

LR4 will be bigger than the other two units but will have a similar depth and workload capability as *LR3*. It will be fitted with a diver lockout mid-body module supplied by Perry Oceanographics, of Florida.

Computer-controlled submersible

An unmanned submersible with a self-contained computer and autopilot has been developed by researchers in the Sea Grant Program at the Massachusetts Institute of Technology. The robot submersible is designed for collection of oceanographic data, surveys and search tasks.

The unit has a design range of 15 miles at a speed of 2.2 knots. The submersible can work at 200-ft depths and has a payload of 25 lb. Length of the unit is 7.52 ft and diameter is 1.23 ft. The robot weighs 240 lbs in air.

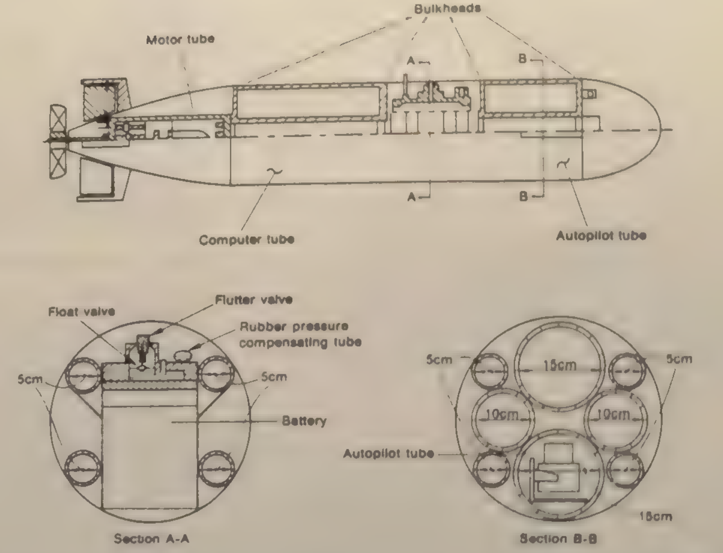
The robot has nose and tail sections made of fiberglass. The cylindrical center body is built of aluminum. The cylinder is divided into three sections by aluminum bulkheads. Four 5-cm diameter polyvinyl chloride (PVC) tubes connect the bulkheads and provide structural integrity.

The front and rear compartments have two 10-cm and two 15-cm diameter PVC tubes to house equipment. The lower 15-cm tube in the front compartment contains the autopilot while the same tube in the rear compartment houses the minicomputer. The middle compartment holds the battery.

The nose cone contains the bow servomotor and sensors. A 15-cm diameter tube on the centerline in the tail section contains the 12 Vdc motor.

An automotive battery modified for immersion in sea water provides power. All of the PVC tubes are waterproof as are the electrical connections.

The computer consists of a central processing unit, memory and three interfaces.



Arrangement of the robot submersible with cross sections of the fore and middle compartments.

The autopilot has three sections: sensors for determining depth, attitude and heading of the vehicle; analog controller for providing control signals to instruct the control surfaces to move, and servo-amplifiers for using signals from the analog controller to provide the power necessary to drive the servomotors.

A tracking system with a pinger is used to determine the position of the robot while underway.

The robot submersible was developed under the guidance of G.J. Keller, A.D. Carmichael and S.D. Jessup, all of the MIT Department of Ocean Engineering, with the help of undergraduate students who carried out design, fabrication and testing of the components for the vehicle. Integrated circuits were supplied by Intel Corp., Santa Clara, Calif. Dr. Albert M. Bradley integrated the preliminary design and fabrication and Joseph M. Driear supervised the development of the software.

ACKNOWLEDGEMENT
This article was digested from "A small robot submarine for oceanographic applications," G.J. Keller, A.D. Carmichael and S.D. Jessup, Massachusetts Institute of Technology Sea Grant Program Report No. MITSG 76-19, November 1976. Copies of report are available for $3.00 from the MIT Sea Grant Program.

Intersub-Kvaerner enter joint venture

INTERSUB, Marseilles, and *Kvaerner Industries*, Norway, have formed a new company, *Kvaerner Intersub A/S*, based at Tranby, Lier, Norway. *INTERSUB* maintains a fleet of seven submersibles and five motherships. The *Kvaerner* companies involved are *Kvaerner Brug*, *Myrens Verksted* and *Thune Eureka*.

Perry Oceanographics, Inc., Riviera Beach, Fla., has appointed **Joel Rizzo** vice president of manufacturing. He will be responsible for the general management of all operations of the Perry Submarine Builders Division.

HISTORY OF THE BATHYSCAPH TRIESTE

The first bathyscaph [illegible] designed and constructed by Professor August Piccard, a Swiss physicist and inventor. The word bathyscaph was coined by him from the Greek BATHOS [illegible] "boat." This term is properly applied only to those deep submergence vehicles which use a gasoline-filled float to carry the pressure sphere in [illegible].

In 1952 P[illegible] of the bathyscaph with the financial and technical support of many institutions, companies and individuals in TRIESTE, Italy. The bathyscaph [illegible] 1953 and christened TRIESTE.

In 1957 TRIESTE [illegible] U.S. Office of Naval Research, subsequently purchased, and assigned to the Naval Electronics Laboratory, San Diego. Its primary mission was [illegible] the research efforts of the United States Navy. Many test programs and scientific projects were conducted during the next few years. Most [illegible] Project NEKTON in which TRIESTE conducted a series of deep dives which was climaxed on 23 January 1960 by a descent to 35,800 feet into the [illegible] Deep. [illegible] the deepest known spot in the world's oceans, had never been penetrated by any manned vehicle, and the record set that day stands alone. For this series of dives, TRIESTE was fitted with a new pressure sphere which was manufactured by the Krupp Works of Germany, and which was designed for operation to 36,000 feet.

In April 1963, TRIESTE was transported to Boston and conducted a search for the wreckage of the submarine USS THRESHER which had sunk with all hands. Scattered debris was [illegible] and several pieces of the ship were recovered. Search operations were terminated in the Fall of 1963 because of adverse weather conditions. TRIESTE returned to San Diego following the initial THRESHER search. Here a new float assembly was installed and the vehicle was redesignated TRIESTE II. The new float was very boxy in shape and made a distinct change in the appearance of the bathyscaph. The original Terni pressure sphere used on TRIESTE I was retained. Following a series of test dives in the Spring of 1964, TRIESTE II returned to the Atlantic to conduct a second search for the wreckage of THRESHER. Using the increased capabilities of TRIESTE II, five dives were made in the disaster area. On two of these dives scattered debris was located and on a third the major sections of the hull were located and closely photographed.

In March 1965, TRIESTE II was transferred to the Commander Submarine Force, U.S. Pacific Fleet and Deep Submergence Systems Project Office (DSSP).

From September 1965 to May 1966 TRIESTE underwent extensive modification and conversion at Mare Island Naval Shipyard. This work resulted in a new appearance of TRIESTE II, and the installation of a new pressure sphere, designed for operation to 20,000 feet. During this period Long Beach Naval Shipyard converted the Floating Drydock ARD 20 into a Bathyscaph Support Ship capable of docking TRIESTE II at sea. During 1966 TRIESTE II and WHITE SANDS (ARD 20) conducted test and evaluation dives, servicing and recovery operations near San Diego to test the entire concept of operation from a support ship.

In August 1967, Submarine Development Group ONE was established. TRIESTE II and her crew became an integral part of this organization. WHITE SANDS (ARD 20) became the bathyscaph support ship and USS APACHE (ATF 67), a fleet ocean-going tug, was permanently assigned as the tow ship for WHITE SANDS. During the remainder of 1967 and during 1968 TRIESTE II, APACHE, and WHITE SANDS operated in the Eastern Pacific.

In February 1969, an Integral Operating Unit (IOU) was formed, composed of USS APACHE (ATF 67), WHITE SANDS (ARD 20) and TRIESTE II. The IOU transited from San Diego, California to the Azores Islands, returning to San Diego in October 1969. The mission for this deployment was to investigate the wreckage of the USS SCORPION, to survey and photograph the vessel, and to compile a report for use in determining the cause of the loss of SCORPION. During this operation, TRIESTE completed nine dives to depths in excess of 10,000 feet and spent a great number of hours on the bottom prosecuting the search and investigation. The Secretary of the Navy awarded the Navy Unit Commendation to the Integral Operating Unit for this achievement.

In 1970 TRIESTE II was placed in overhaul in San Diego. On completion in the Fall of that year she was redesignated TRIESTE II (DSV-1). In October 1971 the IOU again deployed to the Central Pacific for test, evaluation and recovery work, returning to San Diego in June 1972. During this period TRIESTE made three dives to 16,500 feet. This was the first time a submersible had successfully recovered objects from such a depth. For accomplishing this feat, TRIESTE received the Meritorious Unit Commendation.

In the Spring of 1973 the IOU deployed to the Eastern Pacific. Here they participated in another recovery operation during which TRIESTE retrieved an unmanned deep submergence sled carrying oceanographic equipment, which had been lost at a depth of [illegible] feet. The cost to the Navy of replacing the sled would have exceeded a quarter of a million dollars.

In December 1973 TRIESTE II (DSV-1) entered Mare Island Naval Shipyard for overhaul. Shortly thereafter, USS APACHE (ATF 67) and USS WHITE SANDS (AGDS-1) were decommissioned. At the same time a dock landing ship (LSD) USNS POINT BARROW was renamed USS POINT LOMA (AGDS-2) and designated to become the new support ship for TRIESTE.

TRIESTE II (DSV-1) departed the shipyard in May 1975 and commenced at-sea testing of the major new electronics systems installed during the overhaul. Sea trial dives were conducted during late 1975 and early 1976.

TRIESTE embarked in USS POINT LOMA for the first time in February 1977. The training dives which followed proved the ability of POINT LOMA to successfully launch and recover TRIESTE II, and prepare her for diving operations at sea.

In May 1977 TRIESTE II and USS POINT LOMA departed San Diego on a deployment in support of the Seafloor Geophysical Research Program sponsored by the Office of Naval Research. In pursuit of this mission, TRIESTE II carried scientists to the ocean's [illegible] in the Cayman Trench, the Puerto Rico Trench and the Blake-Bahama Outer Ridge. During this deployment, TRIESTE was certified for operations to 2[illegible] feet and completed the deepest planned recovery of any object from the sea floor. After completion of 15 dives at four different dive sites, TRIESTE returned to San Diego on 17 November 1977.

The partnership of TRIESTE and POINT LOMA represents a vast improvement in the capability, mobility and versatility of the Navy's deep submergence program. These ships place 98% of the ocean depths within the reach of man.

))) ***Trieste II* Hits Submarine Volcano at 15,000 Feet.** On its third mission to great depths in the Cayman Trough south of Cuba the Navy's *Trieste II* bathyscaph submersible crunched into the side of the world's deepest volcano at 15,000 feet. Riding in the craft's sphere which protrudes from the underside of the 78.6 ft. long body were Dr. Robert Ballard, geologist of the Woods Hole Oceanographic Institution and the pilots, Lt. Cdr. J. K. Newell and Master Chief George G. Ellis. At that depth the water pressure is 6,750 pounds per square inch, or 486 tons per square foot. At 14,000 feet the craft was descending at 4 feet per second (fps) when the sonar picked up a bottom indication 1,000 feet below. Steel shot were released to reduce the descent rate. When the rate was 0.4 fps, or 0.23 knots, the 80° slope of the volcano suddenly appeared, and the nose ran into it, wiping out the TV camera and damaging the structure. Fluid seen was pressure compensating oil for the camera. If it had been some of the 65,830 gallons of aviation gasoline used for buoyancy (salt water weighs 8 pounds per gallon while the gasoline weighs 6 pounds), the situation would have been hazardous. The mission was ended.

The expedition was designed to gain more knowledge about tectonic plate movements and undersea volcanology. Ballard on the first two missions retrieved relatively fresh lava and volcanic glass, which, because of the pressure had hardened with dissolved gases. The samples began disintegrating in the reduced pressure at the surface. *Trieste II* is operated by Submarine Development Group One, San Diego, Cal. The National Geographic Society participated by furnishing the photography.

On the first dive of the expedition the vehicle went to 20,250 feet, making it the second deepest dive on record. The deepest was 35,800 feet in *Trieste I* set Jan 23, 1960 in the Challenger Deep 200 miles southwest of Guam by Lt. (now Dr.) Don Walsh and Jacques Piccard. On the second mission *Trieste II* stayed down a record 16½ hours and traveled six miles.

Deep-diving research submersible

The Japanese Science and Technology Agency will order a research submersible with a depth capability of 2,000 m. The vessel is expected to be delivered by 1980. The unit will carry a crew of three and will have a maximum speed of three knots. (*Ocean Industry*, April 1977).

Submersible support in the North Sea. Two submersible support ships owned by InterSub Ltd. and operated by Northern Offshore Ltd.—*Nadir*, center foreground, and *InterSub Three*, right foreground,—were used in diver lockout operations at the Frigg field. The *InterSub Three* is launching one of the Perry Oceanographics submersibles owned by InterSub. The French company took delivery of the *PC-1801* and *PC-1802* during the spring to bring the number of submersibles in its fleet to seven. InterSub owns four support ships—*InterSub I, II, III,* and *IV*—and charters the *Nadir*.

Submersible fleet continues to grow

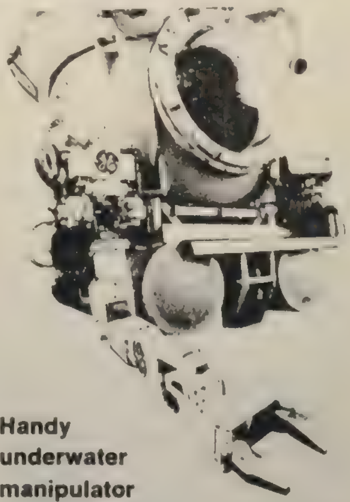
Scott L. Weeden, Associate Editor, *Ocean Industry*

The number of submersibles working and under construction is next to impossible to pin down because of the number of companies entering the field. The latest count *Ocean Industry* has compiled shows 138 manned and 86 unmanned submersibles either in operation or under construction.

These submersibles are used in a wide range of jobs: oil industry survey and inspection; treasure recovery; ship hull inspection; cable burial and inspection; coral harvesting; fishery research; environmental research, and military applications.

At the present time, the manned submersible market has reached a plateau with very few units currently under construction. The unmanned submersible market is still growing with the *RCV-225*, built by Hydro Products, being the fastest selling—11 are in use, four are under construction and one was accidentally destroyed.

With the search for oil and gas going into deeper waters, the demand for submersibles will likely increase. One of the more innovative working systems is Oceaneering International's *ARMS* which features a force feedback manipulator. This allows the operator inside the diving bell to actually feel what he is working on. Oceaneering also will have the largest group of manned submersibles with 18—seven *JIM* suits in operation, two being prepared for immediate delivery and six under construction, as well as an order for two *WASP* suits and *ARMS*.



Handy underwater manipulator

Shake "hands" with the Diver Equivalent Manipulator System (DEMS). GE developed the system and claims it provides the manual dexterity of the human arm and hand—DEMS lets the operator perform all manual tasks done by divers. It has feedback to the operator's hands to let him "feel" the gripped object. DEMS has a reach of 5½ ft and handles 65-lb objects with only 5-lb force from the operator.

Two one-man submersibles on order

A new one-man submersible has been brought to market, and, already the first two have been sold. The submersible is WASP. Designed for working in depths of 2,000 ft, it was developed by Offshore Submersibles Ltd., a subsidiary of the OSEL Group of Great Yarmouth, England.

First orders for WASP have come from Oceaneering International for delivery of two submersibles, their handling systems, TV cameras and maintenance. The first unit will enter service towards the end of 1977.

WASP is designed to undertake inspection, repair and maintenance on subsea structures. The robust, fail-safe, articulated arms can be fitted with a range of manipulators and tools, including cutters, non-destructive test equipment and power tools. Cameras are operated with the manipulators, though there is sufficient room inside for the operator to withdraw his arms and take shots through the viewing dome with a hand-held camera. Internal diameter ranges from 41 to 61 cm.

Foot-controlled thrusters and pumps allow the operator to maneuver in all directions.

Foot-controlled thrusters

The submersible is just 2.1-m long and weighs 500 kg in air. It is designed to work in the cramped conditions around offshore structures. Fitted with foot-controlled thrusters, WASP is self-propelled and easy to maneuver in all directions. In normal use, it is linked to the surface by an armored umbilical. Trim is altered by varying buoyancy using foot-operated pumps and cannot be altered beyond pre-set limits. In an emergency, all external equipment, including the work frame (if in use) and thrusters, can be jettisoned and 150 lbs of buoyancy provided.

Safety was an important factor in development of the submersible, which is designed to Lloyds' highest standards. Should the umbilical snag or fail, a built-in life support system provides eight hours of endurance in fully-automatic conditions or 36 to 54 hrs. on semi-automatic. Comprehensive instruments are provided plus an independent audio-visual system to monitor all critical functions. There are three means of communication with the surface: two independent hard-line systems and sonar.

Cast aluminum body

The main body is built of high-grade aluminum casting and the trunk from filament-wound glass-reinforced resin, allowing the submersible to work on or over rough or soft seabeds and in currents up to 1.5 knots. There are two viewing domes: an inner one of 12-mm glass, pressure-tested to 10,000 psi; and an outer hemispherical protective dome which is impact resistant. This allows 360° vision.

A work frame is also available for jobs where the submersible is in one

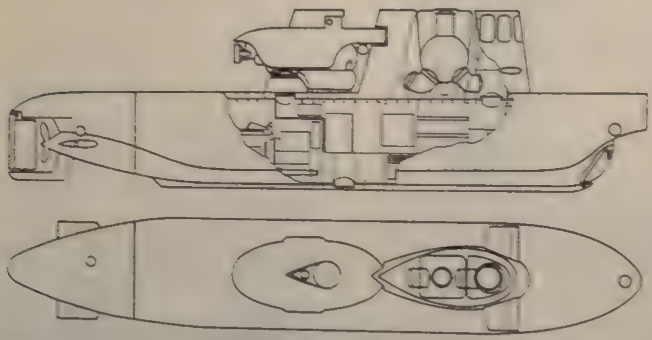
WASP requires minimum deck space for handling.

location for any length of time. This is fitted at the surface, but can be jettisoned subsea.

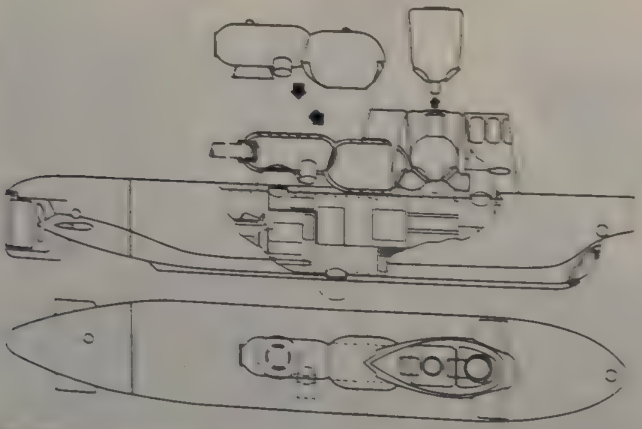
Size of the unit and its associated equipment is such that a work space of only 4 × 6 ft is required, available in virtually any support boat. Hydraulic winches for launch and recovery are also made by OSEL.

A variety of trials have been conducted, including shallow-water tests and pressure tests at the Admiralty Underwater Weapons Establishment. The latter tests were observed and certified by Lloyds. An equivalent depth of 2,700 ft was attained. In June, the submersible underwent deepwater trials in Scotland.

Submersible carries smaller submersible or diving decompression system on deck



TOURS 200/500 carrying the *TOURS 55/600*.



Diver lockout and decompression system fits behind the conning tower.

A self-contained submersible was designed to be mated to a second smaller submersible or to a saturation diving system by Ingenieurkontor Lubeck and Maschinenbau Gabler GmbH. The *TOURS 200/500* can operate at depths of 500 m while the smaller submersible—*TOURS 55/600*—will be able to work at 600 m.

The *TOURS 200/500* can operate at sea for 14 days without surface support and will carry a crew of five to seven men. The submersible has a maximum submerged speed of 11 knots and a surface speed of eight knots.

The large submersible is 24 m long, four m wide and has a draft of 2.7 m. The vessel has a submerged cruising range of 97 nautical miles at a speed of three knots and a range of 1,700 nautical miles on the surface at a speed of five knots. Life support is for six crew-days.

Approximately 750 kwh of electrical power is stored in batteries onboard for submerged operations. A 250-kw diesel engine drives a 225-kw AC generator for surface operations and to recharge the batteries. The submersible has two main propulsion motors driving one main propellor. Two athwartship thrusters and two hovering thrusters provide positioning capability.

Carrying a smaller submersible

The *TOURS 55/600* would be mated to the larger submersible via a transfer hatch. The small vessel would carry a crew of two with a life support of 60 man-hours. The *TOURS 55/600* is 5.6-m long and 2.7-m wide with a draft of 1.5 m. The submersible has one main propellor and four thrusters.

Surface speed is four knots and submerged speed is 4.5 knots. The vessel has a battery capacity of 210 ampere-hours. The unit would ride on the larger submersible directly behind the conning tower.

Diver lockout system

The submersible can also be fitted with a diver lockout and decompression system. The diving system consists of two chambers located directly behind the conning tower. The system can handle two divers.

The divers lockout from the wet chamber, which is directly behind the dry chambers. Transfer of the divers to the surface in a diving bell can be accomplished from the dry chamber through the spherical rescue chamber in the conning tower. This system allows divers to work on missions from the large submersible regardless of surface conditions.

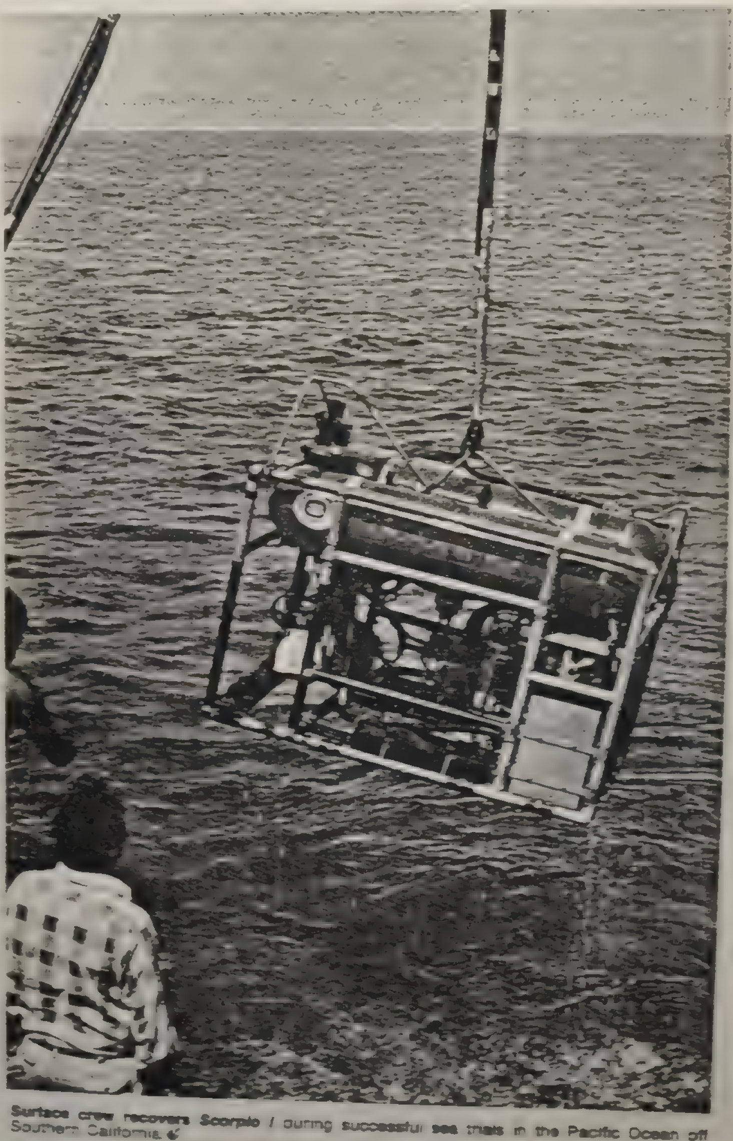
Scorpio completes sea trials

Operating from Ocean Systems' derrick barge *Samson*, *Scorpio I* underwent sea trials in 200 to 2,100 ft of water offshore Santa Barbara, Calif. Ametek, Straza Division, El Cajon, Calif., and Ocean Systems, Houston, jointly tested the unit prior to delivery to Ocean Systems for use in Southeast Asia.

Scorpio I was used successfully to connect a ⅝-in. cable to a padeye on a concrete block in 1,267 ft of water. The cable was attached to a snap hook held on the tether cable. Using a locator and sonar, the submersible began the search for the object in 1,350 ft of water. The unit was maneuvered to the block where the hook was snapped onto the padeye. The *Scorpio I* moved away from the block, forcing the cable to separate from the tether. The submersible and the block were recovered separately.

The unmanned submersible is equipped with an Ametek Model 250 CTFM (Continuous Transmission Frequency Modulated) sonar, five-motion manipulator, television camera and lights. The unit has a 3,500-ft tether cable. Optional equipment includes a still camera, side-scan sonar and independent power source. Four 5-hp thrusters maneuver the unit. A second type of unit—*Scorpio II*—comes equipped with two manipulators and has a higher payload.

A new Ametek vehicle locator and tracking system was also tested during the sea trials. The system provides information on three critical functions: continuous vehicle tracking, location of a bottom reference acoustic marker, and location of the vehicle acoustic pinger in case of emergencies. The unit's sonar provides critical terminal guidance information to the operators in extremely poor visability conditions.



Surface crew recovers ***Scorpio I*** during successful sea trials in the Pacific Ocean off Southern California.

[illegible]

edited by RICHARD A. GEYER, Department of Oceanography, Texas A & M University, College Station, Texas, U.S.A.

1977 xxii + 384 pages
Price: US $49.00 / Dfl. 120.00
ISBN 0-444-41545-9

Here for the first time is a book on submersibles, containing all the information previously scattered throughout large numbers of journals, which will undoubtedly become an invaluable reference for all those working in the many branches of oceanography and marine engineering.

The advent of the manned submersible in the 1970's is regarded as a very significant development and today submersibles, both manned and unmanned, play an increasingly important role in solving a great variety of oceanographic problems. Now a scientist can, for example, select the precise location of a particular sample, and rare and delicate species can be found, observed and photographed in their natural surroundings before being collected and transported - undamaged - to the surface.

Examples of the uses to which existing submersibles have been put are described in this book in the form of case histories covering a wide range of geographic locations and representing many disciplines. Examples of ocean engineering activities include submarine pipe-line site surveys, construction and inspection methods, ocean dump-site evaluation and surveillance, sewage outfall studies and establishing ecological base lines prior to offshore oil and gas production.

The present and future roles and the relative merits of manned and unmanned submersibles in the ocean sciences are analysed and compared and an appendix provides detailed information on the capabilities, construction and instrumentation of more than 100 submersibles.

CONTENTS: Introduction (*R. A. Geyer*). **Section I. History - Respective Roles and Merits of Manned versus Unmanned Submersibles in Solving Oceanographic and Ocean Engineering Problems.** 1. The Rationale for Submersibles (*T. K. Treadwell*). 2. Unmanned Submersibles (*R. F. Busby*). 3. The Unique Roles and History of Manned and Unmanned Submersibles in Oceanography (*D. [illegible]*). 4. Manned and Remotely Operated Submersibles Systems - A Comparison (*H. Talkington*). **Section II. Case Histories of Diversified Uses.** 5. The Role of Submersible in a University (*R. A. Geyer and T. J. Bright*). 6. Reconnaissance of Reefs and Fishing Banks of the Texas Continental Shelf (*T. J. Bright and R. Rezak*). 7. The Role of Manned Submersibles in Sedimentological and Faunal Investigations on the United Kingdom Continental Shelf (*J. B. Wilson*). 8. Submarine Geology from Submersibles (*B. C. Heezen*). 9. The Submersible - A Unique Tool for Marine Geology (*G. H. Keller*). 10. U.K. Experience of the Uses of Submersibles in the Geological Survey of Continental Shelves (*R. A. Eden, R. McQuillin and D. A. Ardus*). 11. Submersibles - Geological Tools in the Study of Submarine Canyons (*H. D. Palmer*). 12. Use of Submersibles in the Construction of Submarine Pipelines (*L. van den Berg*). 13. The Use of Manned Submersibles in the Study of Ocean Waste Disposal (*H. D. Palmer*). 14. The Asherah - A Pioneer in Search of the Past (*G. F. Bass and D. M. Rosencrantz*). Appendix I. Summary of Characteristics, Status and Use of Undersea Vehicles Worldwide (*J. R. Vadus*). Index.

For customers in the U.S.A. and Canada:
ELSEVIER NORTH-HOLLAND INC.
52 Vanderbilt Ave., New York, N.Y. 10017

For customers in Australia:
D. A. BOOK DEPOT PTY. LTD.
11-13 Station St., Mitcham, Vic. 3128

In all other countries:
ELSEVIER SCIENTIFIC PUBLISHING COMPANY
P.O. Box 211, Amsterdam, The Netherlands

Submersible recovery of wellheads cuts costs

Substantial savings in time and cost are claimed for a new method of recovering abandoned wellheads in the North Sea. Launched by P&O Subsea, the system uses a submersible and its support ship only, thus dispensing with the need for a drilling rig to remain on or return to the site when equipment is recovered. Neither are divers necessary.

P&O Subsea has used the system over the past few months on a trial basis, and now offers it as a "no cure-no fee" deal. Method involves a submersible going down to the wellhead, clearing debris and then placing explosives in the top of the casing. The explosion cuts off the whole unit several feet below the seabed and recovery is by means of specially-designed handling equipment on board the support ship.

All the company's submersibles are equipped to carry out the work. Cost will obviously vary according to water depth and other factors, but a figure of $52,000 to $86,000 is reckoned as typical. Again, savings against existing methods are hard to quantify, but P&O Subsea feels that substantial is the right word.

Underwater Lab Proposed

Meanwhile, in a different project, the National Oceanic and Atmospheric Administration (NOAA), is proposing that the taxpayers spend $20 million to build a mobile underwater laboratory capable of autonomous operation for 30 days, at depths of 300 or 1,000 feet (depending on design), and over distances up to 100 miles. It would be a biggie: Up to 600 tons, 125 feet long, and 20 feet in diameter. This one sounds like a "solution" looking for a problem or a bureaucrat looking for a mission and would likely cost a great deal more than present estimates.

Better navigation for submersibles

Ferranti Offshore Systems has developed a navigation system for submersibles that recently maintained an accuracy of 5-10 cm over distances of several hundred meters in North Sea surveys. Called HASINS for High Accuracy Submersible Inertial Navigation System, its accuracy limit is claimed to be .0025 cm. Applications for the system include distance measurement for underwater tie-ins, offshore installations, pipe line inspections and general surveys. HASINS is self-contained within the submersible and needs no external references.

HASINS is far superior to other methods of underwater position-determining methods, which have proved slow, inconvenient, and inaccurate.

Fitted with HASINS, a submersible can determine its position in Eastings and Northings relative to a known starting point at any time, quickly, easily, and precisely.

Because it is self-contained, it is completely independent of external reference aids with all their associated problems.

And, unlike other systems, HASINS stores its present position data in the event of main power supply failure.

HASINS has been specifically developed for submersible use from Ferranti inertial systems whose high reliability and outstanding performance have been well-proven in hundreds of military supersonic aircraft and space rockets.

However, to meet the higher accuracies required for offshore use, the standard airborne navigator has been converted into an even more accurate system, capable of measuring in increments of a mere one thousandth of an inch.

EQUIPMENT

The essential elements of the system are an Inertial Navigator, a General Electronic Navigation Interface Equipment (GENIE), and a Display and Control Unit.

The Inertial Navigator is a one-box standard aircraft system containing an inertial platform and Digital Inertial System Computer (DISC). The platform is the key to the whole system and comprises three accelerometers stabilised in all directions by three high-precision gyroscopes. The accelerations of the platform (and thus the submersible) are measured very accurately by the accelerometers and the DISC uses a mathematical formula once to calculate the velocity and twice to calculate the distance moved. This is in the form of standard aircraft measurement units, and electronic processing of this data is then undertaken in the GENIE. It is the sophisticated yet reliable circuitry of this unit which reduces the increments into measurements of one thousandth of an inch.

Although it is only relative displacement that is derived, it is easy for the computer to add these algebraically to produce the new positions in latitude and longitude, or in grid.

The Display and Control Unit allows an operator to insert and read the data, and this is also used to switch the Inertial Navigator into its various operational roles.

OPERATION

Before starting a survey, HASINS has first to be aligned to true North. However, after the position of an initial, known reference point is inserted into the control unit, the process is automatic. HASINS is unique in that it aligns itself to a plane at right angles to the local vertical. Thereafter, the submersible is ready to move off with the system fully operational and position data available on demand.

In order to maintain the level of accuracy required, the system has to be periodically up-dated. This merely involves stopping the submersible for a matter of seconds at intervals of anything from one to ten minutes : the shorter the intervals the better the accuracy. Such up-dating procedures are thus dependent on the accuracy required for the particular nature of the work being undertaken by the submersible. They do not unduly interfere with the vehicles work schedule.

Whatever the duration of the stop or the interval between stops, the up-dating process is automatic, and simply requires the pushing of a button on the control unit. The computer does the rest.

TYPICAL APPLICATION

A typical application of HASINS was its use by Intersub Ltd. to survey two overlapping pipe sections at a tie-in site on the Frigg pipeline of Total Oil Marine.

Fitted in submersible PC 1204 which was supported by the mothership Intersub II, the system was used to determine the precise co-ordinates of seven reference points on the two sections.

Several surveys of these reference marks were performed and Intersub have stated that in their opinion the results showed that an accuracy of between 5 cm and 10 cm can be obtained reliably for underwater distances of several hundred metres.

OTHER APPLICATIONS

Applications of HASINS fitted in manned submersibles include accurate distance measuring for tie-in or other underwater connections, installation and supervision of offshore structures, pre-burial and post-burial inspection of pipelines, seabed search and general survey, cable-burying, topographical survey, underwater navigation independent of external aids, and accurate positioning of bottom points by combined inertial navigation and Hi Fix-type equipments.

FERRANTI
Offshore Systems

Ferranti Offshore Systems Ltd.
Ferry Road Edinburgh EH5 2XS
Tel: 031-332 2411
Telex: 72141

Seaforth Centre
ABERDEEN
Tel: 0224 21997
Telex: 73387

2 FIRMS VIE FOR WORLD LEADERSHIP

Remote-Controlled Subs Pushed Here

By CECIL SCAGLIONE
Financial Writer, The San Diego Union

Two local firms cruising ahead of the pack in the worldwide design and development of a remote-controlled submarines see a market as limitless as the oceans in which these underwater vehicles work.

Sorrento Valley's Hydro Products and El Cajon's Ametek Inc., Straza Division, admit they are each other's major rival in the race to maintain global leadership in this industry.

And 1978 looks like the key year.

Both companies make several other products and have been too busy designing and testing their submarines to take time to gauge the market.

"We see no limits," said Ron Walrod, vehicle division general manager at Hydro Products. "But we don't think the limits of the market are even understood yet."

OIL INDUSTRY USE

"The oil exploration industry has to accept the use of unmanned submarines and, once they are proved, there are no projections on how large that market can be," said Deam W. Given, undersea vehicles marketing manager at Ametek.

Walrod said his company has produced 90 percent of the unmanned submarines now in use around the world.

12 WORKING

"We have 12 of them working out there," he said. "We plan to produce eight more this year. We have a firm order for one and five more are due for delivery in 1978. That will leave two in our inventory.

One goal sought by both Walrod and Given is to have a stable of robot submarines on hand to be prepared for anticipated customer demand.

Hydro Products was established in 1966 and began developing its remote control vehicle (RCV) shortly after it was acquired by Pasadena-based Tetra Tech Inc. about four years ago.

The first model, the RCV-125, was the size of a beer keg and housed a television camera for use in off-shore mining and oil exploration and equipment inspection.

This was developed into the higher-performance RCV-225.

The company is developing an RCV-150, which has a claw-equipped arm attached to a housing about twice as big as the first-generation submarine. This model's arm has a shoulder, elbow and wrist. The elbow joint includes a circular saw that can cut up to a half-inch steel cable.

SMALLEST MODEL

The RCV-225 is the smallest unmanned submarine in service and sells for $380,000 to $400,000. The RCV-150 sells for $500,000 to $600,000.

The people at Straza Division, which was acquired by New York-based Ametek in 1968, feel that while their pride and joy — SCORPIO (Submersible Craft for Ocean Repair, Positioning, Inspection and Observation) — doesn't compare favorably in size with the RCVs, it does include sonar that the Hydro Products model lacks.

The SCORPIO is about double the size of a Volkwswagen Beetle. It sells for $400,000.

Both the RCV-150 and SCORPIO include a moveable arm, launching mechanisms, surface monitoring and operating consoles and controls and are designed for deep underwater general purposes chores.

The mechanisms, options and refinements in each system differ.

"Our RCV-150 isn't completely accepted yet," Walrod said, "but we're doing well with the RCV-225. We're still going through the cascade effect — whenever we get a vehicle operating out there, the customer can think of five other things he'd like it to do so we keep improving our product."

Hydro Product sells its robot submarines. It does not lease any.

Ametek, in its efforts to let prospective customers see how its product works, leases its undersea vehicles to anyone interested.

"These vehicles take four to six months to build," Given said. "We plan to build four this year on speculation so they will be available to get out into the field within 30 days when we get a customer request."

4 OTHER FIRMS

There are only four other firms that Given and Walrod acknowledge as possible competitors. They are International Submarine Engineering in Vancouver, Perry Ocean Products in Florida, British Aircraft Corp. and Saab of Sweden.

None is as advanced as the two local firms in production and performance acceptibility of the smaller unmanned submarines, they said.

Both agree that the big market for these underwater robots is the oil exploration and development industry. There are possibilities also for military use, recovery operations and archeological projects.

Ametek is so optimistic about the future sales of its product that the SCORPIO program is being shifted into a 22,000-square-foot building at the El Cajon complex.

Walrod said he expects to add 20 to 30 employees this year to his section's 60-member staff.

"The diving community is being phased out as companies are forced to go deeper and deeper for their oil," Given said.

Unmanned submarines have the advantage of going deeper (as far as 6,000 feet), eliminating the threat of injury or death to a diver or submarine operator, and performing chores and inspections much more quickly and less costly than manned submarines or divers.

As an example, Ametek sold two SCARABs (Submsersible Craft Assisting Repair and Burial) to American Telephone & Telegraph last year through a multi-national consortium.

The SCARAB, predecessor of the more sophisticated SCORPIO, can make underwater cable repairs within three to four days.

CUT TIME, COST

"Under the old system, ships had to be sent out to grapple around the ocean bottom until they could seize the cable and haul it to the surface to be repaired," Given said.

"This took three to four weeks normally and was very costly. AT&T has to pay from $500,000 to $1 million a day to satellite communications companies when its undersea cable is out of service."

Charles Strickland, Hydro Products president, said, "Operating a manned submarine costs at least 10 times the daily rate of an RCV, which costs about $2,000 a day."

Given pointed out that shut-down time is costly for the expensive equipment used by oil explorers.

"These unmanned submarines lets them inspect and maintain their underwater equipment with the minimum of expensive shut-down time," he said.

Hyco Subsea Contract For Pipeline Inspection

Hyco Subsea, Houston, has received a contract for the 1977 subsea inspection on a portion of two 30" HIOS pipelines. *Aquarius*, a minisubmarine, and specialty vessel *Hudson Handler* are involved in the project. According to the company the work represents the most extensive mini-submarine deployment ever made in the Gulf of Mexico. The work covers approximately 60 miles of bottom, at depths over 200 feet.

Cold water drowning victims revive

Underwater for 38 mins., an 18-year-old was resuscitated; two weeks later he was back in school as an "A" student.

A Sea Grant announcement of the high potential for reviving cold-water drowning victims has fired the interest of many since early summer. Dr. Martin J. Nemiroff, University of Michigan Hospital, discovered victims of cold-water drownings can sometimes be revived, even when all vital signs indicate they are dead. He made this discovery after a three-year study of 13 "dead" victims, nine of whom recovered.

Following an August press release of his discovery, people have reported similar cases to him. But most important to Dr. Nemiroff is the heightened awareness of hope for reviving the victim. The doctor urges rescuers to use aggressive resusitation in cold-water cases—even though, he cautions, his research findings don't indicate guaranteed recovery.

Submerged 38 minutes

The most spectacular survival is an 18-year old who was trapped in his submerged car in an icy pond for 38 minutes. When he and his companion were brought to the surface, both were pronounced dead. But as the bodies were being loaded into an ambulance, one victim gasped—a sort of involuntary belch often associated with death. Resuscitation was started immediately.

Following two hours of resuscitation and 13 hours of respiratory support, the victim regained consciousness. Two weeks later he returned to college where he later graduated an "A" student. His companion in the car, whose body made no sounds and was not resuscitated, is dead.

This case and the eight others in the three-year investigation prompted the doctor to challenge the traditional four-minute oxygen deprivation limit—thought to be the point of irreversible brain damage. The saving mechanism, he concluded, is a human version of the mammalian diving reflex.

The reflex which exists in porpoises and whales has been known to scientists since the 1930s. In an emergency, the porpoise remains submerged up to 20 minutes and the whale stays down as long as two hours. In humans, he found the mechanism activates only when the victim's face submerges in waters 70°F or colder.

How it works

The reflex reduces the blood supply to the skin, muscles and other tissues which are resistant to oxygen-loss damage, reserving remaining oxygen for the brain and the heart. Cold water also reduces the oxygen need of tissues, further lengthening survival time.

Children under 3½ years are most likely to be saved by the reflex. Seven of the original nine recoveries were in that category. He says this is probably a protective response carried over from fetal life in a fluid environment.

Saving the victim

Dr. Nemiroff's advice to rescue workers: "**Do not give up,** even if the victim looks dead. He or she may be cold, blue, not breathing, have no detectable pulse or heartbeat, and fixed and dilated pupils, but the victim should not automatically be presumed dead."

He recommends starting external heart massage immediately, while giving either mouth-to-mouth breathing or oxygen ventilation. The victim should be covered only lightly until reaching medical facilities. Then the body should be warmed gradually from the inside by raising the oxygen temperature to 110°F with a humidifier.

Resuscitation should be maintained at least until the body temperature reaches normal, he says. Defibrillations—shocking the heart into action—may not succeed until the normal body temperature is reached.

To improve public awareness of the life saving measure, the Michigan Sea Grant program and the U.S. Coast Guard will soon issue a booklet on the subject. It will be available on request in mid-December through both the Michigan Sea Grant Publications Office and local U.S. Coast Guard agents.
agents.

Research plans

Additional research will advance treatment and reporting procedures and improve coastal and diving safety. Dr. Nemiroff is working towards an accurate count of Michigan's cold-water immersion accidents for the years 1972 through 1976. He is also studying new cases as they are recorded. With these data, he hopes to categorize the accidents and to prepare a treatment protocol for coastal hospitals.

To realize the hope of sustaining a human life—**don't give up!** ✓

Underwater Test Facility Renamed in Scotland

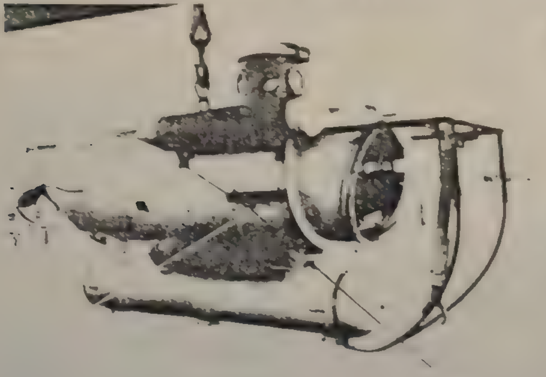
Scottish Underwater Research and Development Facilities at Fort William on Loch Linnhe and at Rothes near Edinburgh known since their commissioning as UEG Trials Ltd. has been renamed Underwater Trials Ltd.

The facilities permit a wide range of testing of underwater instrumentation and equipment in sheltered waters, a depth of over 500 feet in Loch Linnhe and a depth in excess of 2000 feet at Rothes site.

PC12 is similar in configuration to PC15. The standard workboat version (and the diver lockout) has a modular hull that can be reconfigured or up-graded at a later date. New developments can be accommodated by having your PC12 "grow" rather than require a new vehicle. This unique feature, standard on all Perry vehicles, is an example of the value of Perry's innovative technology. The PC12 standard workboat is in service in the North Sea.

22' long, 6 tons, 35 KWH, twin manipulators TV, VTR, Sonar, 750 lbs. payload after included equipment and two personnel.

PC-12
1200' Standard Workboat



PC14 is the least expensive of the Perry line, yet it retains the solid technical excellence and safety built into every Perry submersible. Quick-change batteries in a dry droppable pod, panoramic window, a manipulator, communications, and factory training by Perry's expert pilots and maintenance technicians are included in PC14's exceptionally low price. As with all Perry products, Perry's broad experience and engineering are at your disposal. Perry can complete your submersible system with launch and retrieve system, and auxiliary equipment.

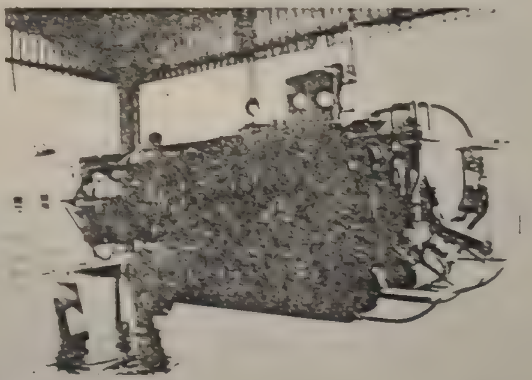
20' long, 6 tons, 17 KWH, manipulator, TV, VTR, 750 lbs. payload after included equipment.

PC-14
1200' Standard Workboat

PC12 DIVER LOCKOUT is an example of economic use of modular hull construction. Total life support systems for two divers at 1000 feet are included in this versatile workboat. The large panoramic window in the forward compartment allows one atmosphere observation of the working diver. Optional topside mating facilities with a decompression chamber provide extended duration missions yielding a most economical means of diver use.

32' long, 15 tons, 52 KWH, TV, VTR, Sonar, 1000 lbs. payload after included equipment and four personnel.

PC-12
1000' Diver Lockout Workboat



A compact diver lockout workboat of 12 tons, PC18 has all the larger boat features—twin manipulators, Sonar, solid state motor controller—and many others. PC18 is small enough to be easily handled and supported, yet large enough to work in the open ocean offshore. These capabilities combined with economic price make PC18 an excellent value. Two PC18's are currently under construction for delivery to the North Sea in early 1977.

22' long, 12 tons, 35 KWH, TV, VTR, Sonar, 1000 lbs. payload after included equipment.

PC-18
Standard Workboat to 984'
Diver Lockout to 656'

OCEANOGRAPHERS FIND HOT WATER, UNUSUAL ORGANISMS ON GALAPAGOS RIFT

Scientists from the Woods Hole Oceanographic Institution and other institutions diving in the submersible ALVIN report they have examined in detail several hot water vents on the deep ocean floor. Groups of animals apparently thriving in water up to 9°C (16°F) warmer than the normally near-freezing surrounding water have shown the observers where to focus their studies. At these depths, 2,500 to 2,700 m (about 9,000 ft), the seascape is usually devoid of such clusters of large organisms.

A record 11 dives in 11 days were made on the first half of a cruise beginning February 1977 to the Galapagos Rift in the Pacific Ocean as scientists seek to enlarge their understanding of the history of the Earth. This is the third major expedition over the past 4 yr to spreading centers where huge plates on which the continents ride are moving and growing very slowly.

As these tectonic plates move over the globe, new volcanic material wells up from the Earth's interior to fill gaps between them. Observations by scientists inside the 23-ft ALVIN and from photographs made by a camera sledge towed by the surface vessel KNORR of the Woods Hole Oceanographic Institution have matched those made on the Mid-Atlantic Ridge in 1974 and in the Cayman Trough near Cuba early in 1976. Bulbous pillow structures some 30 cm (about 1 ft) across and relatively flat flows of lava are typical. The Galapagos work has presented the first observations of active hot water vents emerging from holes about the size of a cereal bowl in pillow lava.

The ease of finding such vents at Galapagos may be because of the relatively flat topography of the area, according to the Chief Scientist aboard the KNORR for the first half of the Galapagos cruise. The highest elevation in the Galapagos is about 300 m, while on the Mid-Atlantic Ridge mountains up to 2 km high were found. The rougher terrain probably allows freer interchange of warm water circulating through the subsurface rock with the bottom seawater. The more even terrain of the Galapagos rift may also make it easier to find the warm water vents.

The scientists call the animal communities clustered around the vents "clambakes." Fields of dandelion-like organisms (possibly soft coral or crinoids) and clams up to 10 in across and up to 10 other species have been observed in these communities, which stretch from a few to tens of meters across. The abundance of the "clambakes" was unexpected, and there are no biologists on the expedition, so positive identification will wait until the geologists and chemists aboard return to their homeports with samples.

ALVIN carries equipment on these dives designed especially for studying the hot water vents, which were first spotted in photographs taken last summer during work by the Scripps Institution of Oceanography research vessel MELVILLE. Studies of heat flow through the bottom and of near-bottom water temperatures in the area have been underway for several years using towed instruments. The current hypothesis is that there are large convection currents that move water down through sediment and rock layers, perhaps several km, where it is heated, and then it rises by percolating back up through the rock and sediment layers to mix with ocean bottom water. The scientists have found higher temperatures in bottom features about 20 km south of the rift in curious mounds which occur in straight lines. The mounds are about 20 m wide and rise to as much as 20 m above the flat sedimented bottom with side slopes up to 30 degrees. These mounds are also believed to be related to hydrothermal circulation.

A temperature sensor with digital readout inside the sub was designed and constructed at the Woods Hole Oceanographic Institution for this cruise, and ALVIN is equipped with a water collection hose intake and sampling system designed at Oregon State University for precise placement at the vent with the sub's mechanical arm. Another device, which also measures temperature, salinity, pH, dissolved oxygen, and suspended matter in the water, was constructed at Scripps based on instrumentation used in the large Geochemical Ocean Sections study conducted by surface ships in 1972 and 1973.

As the seawater circulates through the subbottom rocks, it leaches metals and other elements from them. Analytical work by chemists aboard KNORR has shown the water at each vent to be distinctive with high concentrations of radon, dissolved hydrogen, silica, and hydrogen sulfide, and low concentrations of oxygen and low pH.

An ocean bottom monitoring system was placed at one of the vents at the end of the first half of the cruise, when KNORR, ALVIN, and ALVIN's mother ship LULU went to port in the Galapagos Islands for rest and refueling. This system was to record temperatures and water currents at the vent for 10 days before recall to the surface at the beginning of the second half of the cruise. The ships departed March 5, 1977, and the second half of the diving program commenced March 8. Time on the cruise may allow up to 12 additional dives.

One of the major questions raised by the large biological communities around the hot water vents on the Galapagos Rift is what do they eat. A marine microbiologist at the Woods Hole Oceanographic Institution suggests that the unusually high amount of life observed near the underwater springs is only marginally related to the increased temperature. The basis for this phenomenon is probably a well known microbiological one which occurs wherever there is high hydrogen sulfide in the water. Though well known in shallow water, this is the first known occurrence in the deep sea. The source of biological activity in the deep sea is usually assumed to be organic matter that reaches the sea floor through sedimentation from surface waters. At the Galapagos vents the source of energy for the growth of organisms apparently emerges from the submarine springs in the form of hydrogen sulfide. This reduced inorganic sulfur compound can be used by a certain group of bacteria as electron donors, that is, the source of energy, for turning carbon dioxide into organic carbon. This is basically comparable to the process green plants employ with the aid of light instead of reduced sulfur. Profuse growth of these sulfide-oxidizing bacteria, then, produces the ideal food for filtering organisms, which may include the large clams or, more likely, smaller organisms on which they feed. With this food chain, the amount of life found around these springs will be more or less directly related to the amount of hydrogen sulfide contained in the emerging water. The rates at which these biological transformations occur will also determine how much biomass is produced, and temperature and pressure will affect the rate.

Hydro Products has appointed **Robert Spry** as engineering manager of the Vehicle Division. A further change in the same division is the appointment of **Bert Baker** as sales engineer.

ADDENDUM TO JANUARY 1978NEWSLETTER

Ye Editor finds that his notes (when he can find them) are better than his memory and blushingly adds the following to keep the record straight:

An impromptu DSPA luncheon was held at the Admiral Kidd Officers Club in San Diego on 5-30-77 on the occasion of Mike MacDonald's visit on business.

Present:
John Cameron
Don Saner
Will Forman
Bob Worthington
Mike MacDonald
Rick Olson
Jerry Shiller
Merle Wilson

Mike described his new association as General Manager of International Submarine Engineering and gave an account of the TROV (Tethered Remote Operated Vehicle) which they market. Mike hopes all DSPA visitors to Houston will call him at (713) 681-8816. John Cameron provided an update on TRIESTE, SEACLIFF, and TURTLE operations, and Merle Wilson gave a rundown on the NEKTONs and Gulf of Mexico prospects. The proposed DSPA meeting at OCEANS77 was discussed; and General Oceanographics, as an exhibitor, offered to provide guest passes to DSPA Members who don't wish to foot the bill for complete registration in order to attend the Underseas Vehicles sessions and DSPA meeting.

ADDRESS LIST CHANGES

MacDonald, Michael D.

Res:
Vancouver, B.C., Canada
(604) 937-5147
Bus: International Submarine Eng., Ltd
2601 Murray Street, Port Moody
B.C., V3H1X1, Canada
(604) 931-2408
Res. & Bus: Houston, Tex.(713)681-8816

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

April, 1978

Vol. XII, No. [illegible] by the Deep Submersible Pilots Assn.

The DSPA was formed in [illegible] to provide for a free interchange of ingormation relative to deep submersible design, operations, techniques, and material in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER should be addressed to:

Robert K. R. Worthington (714) 453-1158
Editor, DSPA
3005 Curie Street
San Diego, CA 92122

Correspondence regarding new menber applications should be addressed to the Membership Committee Chairman as follows:

Willis Forman (714) 273-2967
3940 Sioux Street
San Diego, CA 92117

EDITORIAL NOTES And COMMENTS

Now that the exigencies of 15 April income tax return submission have been taken care of, I have time for things like a Newsletter and spring planting-both long overdue, as usual.

OTEC time is approaching again (see schedule herein). The meeting on Manned Submersibles is scheduled for 9 May. It is hoped some members will be able to get together in Houston. Larry Megow is always a point of contact there at Hahn & Clay. MIke MacDonald and Bob Starr are also based in HOuston.

Irene Fager's "One Half Fathom" provides a great source of information re people and vehicles in our field, as evidenced by the number of her items included in this Newsletter. Even if you are not interested in stamps or covers, you will find a subscription worthwhile. An application form is reproduced herein.

"Gray Lady Down", a thriller about deep submersibles to the rescue premiered in San Diego under sponsorship of the Navy League, complete with a personal appearance by our hero Charlton Heston. Larry Megow's review in this Newsletter makes further comment superfluous. (Thanks, Larry!) Larry's full review gave away too much of the story development, so we are printing his condensed version to maintain your suspense. Don't miss it, you deep-divers!

SECRETARY'S REPORTS & NOT

Dues for 1978 (5.00 for [illegible] Canada, $10.00 overseas) are overdue from a dozen members. Please check your membership card to see if it indicates1978 dues paid. Remit to Secretary so that payment will be entered in his records.

Apologies to Boggs, Boulton, and Vernon for dunning them in the January Newsletter. They were victims of incomplete communications between Secretary and Treasurer.

Since Starr and Toler promptly submitted their dues, it can now be reported that we did not have any dropouts last year.

Pins are now in stock and available at the remarkable price of $2.00 each from your Secretary. The 4-inch DSPAinsignia stickers are still $1.00 each; when ordering, designate "inside" or"outside" type desired.

Elections- Ballots are forwarded with this mailing. Please return promptly.

The Nominating Committee consisted of Forman, Helle, Olsen, Shiller, and Wilson.

New Members welcomed on board recently are as follows:

Alan Whitfield: Senior Pilot, Vickers Oceanics
Bruce Martin: SDL-1, Canadian Fleet Diving Unit Atlantic
Michael McQuown: NR-1 O-in-C
John O'Donnell: NEKTON
Matthew Fisher: NEKTON
Robert Taylor: PISCES IV
Jean-Marc Plancon: GRIFFON

DSPA Luncheon Meeting at Tarentino's, San Diego 1/16/78

Members present:

D. Saner
W. Forman
J. Shiller
R. Worthington
C. Hoyt
M. Wilson
J. Newell

Non-members present:

P. Branson- Scripps Institution of Oceanograpy

Attendance wes reduced by last minute cancellations due to, among other pressing factors, a battery problem on TRIESTE, offloading DSRV from TRANSQUEST at North Island, and John Cameron's short memory! Nevertheless, Tarentino's improved buffet was enjoyed by all; and Kirk Newell's talk and slide pictures of TRIESTE's 20,000-foor dives in the Atlantic and Caribbean provided a large quantity of fascinating information. TRIESTE's new capabilities are very impressive, particularly when compared to the performance of the [illegible] TRIESTE I.--Carol Hoyt revealed that General Oceanographics has given up on trying to purchase a ready-made NEKTON submersible and is about to commence construction of a 90' x 40' vessel of their own design but resembling Lockheed's TRANSQUEST. Construction will be at Morgan City, and deployment will be in the Gulf of Mexico.

DSPA Luncheon Meeting at Tarantino's, San Diego, 2/7/78

Members present:

J. Cameron
R. Worthington
M. Wilson
G. Shiller
W. Forman
R. Olsen
D. Saner
D. Rosencrantz
8

Non-members present:

Al Smith- Lockheed Ocean Lab
John O'Donnell- Gen'l Oceanographics
Jerry Fisher- " "

Don Saner reported that DSPA pin resupply was back in the groove with expectation of early delivery.--A Nominating Committee was appointed with Will Forman as Chairman to prepare a slate of nominees for DSPA offices.--Don Rosencrantz described NOAA/Harbor Branch/Perry operations last summer in investigating the MONITOR wreck site. Don participated as advisor in photogrammetry due to his previous experience in these techniques with ASHERAH during the University of Pennsylvania Mediterranean expeditions. Don also spoke of an interesting test of ESP assistance during submersible search operations off Catalina and the hopes of further tests in dives to greater depths, desirably 6000 feet or more, to test ESP effectiveness under physically limiting conditions.

DSPA Luncheon Meeting at Tarentino's, San Diego 3/7/78

Members present:

J. Cameron
C. Hoyt
R. Worthington
D. Rosencrantz
D. Saner

Non-members present:

Ron Rau--- Lockheed Ocean Lab
Frank Simpson- " " "
Dave McCafferty- TRANSQUEST
Mel Wills--- "

Don Saner reported pins on order, delivery in April.--Nominating Committee has not managed a quorum to approve a slate of DSPA election candidates [illegible] [illegible]crantz passed around photos and literature re Harb[illegible] [illegible] and organization. Pretty nifty setup, to be sure!--[illegible] bad news that the fuel cell power supply for DSRV [illegible] [illegible]ed by DEEP QUEST has developed one problem too many [illegible] never be installed in the DSRV's. Deep quest developmental testing will be continued for the time being.--Construction of General Oceanographic's support vessel will commence this month at Morgan City.

REPORTS FROM MEMBERS

Larry Megow (1/23/78)
"We're working on three submersible programs (at Hahn & Clay) all long term projects and as yet not released for any publication. If and when any of them get off the red-tape, paper, money syndrome, I'll provide you with a detailed report.

"Right now Hahn & Clay is loaded with work for muclear power plants, and we don't have much shop space for too many other projects.

"Mike MacDonald and I haven't been able to get together, but one day we will have a two man impromptu committee meeting and will report the results."

Vance Bradley(1/25/78)
"Two bits of news come to mind. The first being that Intersub has purchased the two vehicles (PC-1205 and 1804) now under construction at Perry. 1205,a standard Perry observation-type vehicle, has been unable to undergo a deep test dive offshore due to the horrendous winds we have been blessed with of late, so is presently being fitted out for a test tank dive. 1804 has just started assembly and will not be delivered until early April. One other point is a comparison to a small blurb in the newsletter entitled "Working inside platform jackets". Intersub has a somewhat simpler system that allows our 18's to clamp onto a structure and perform mid-water lock-outs at any level of the structure. Very handy for NDT and general repair."

Doug Privitt (2/6/78)

"I hope to have my new submersible finished sometime this summer. Sorry I can't make a contribution to the newsletter. Not much happening."

Ray Toler (2/19/78)

Being here in Charleston keeps me from being able to keep up with what is happening in the Deep Submersible business. I do enjoy the Newsletter and look forward to receiving them. I will be retiring from the Navy this December and will be looking for a job. I am hoping I will be able to get into something to do sith Deep Submersibles."

Steve Boulton (1/29/78)

"I'm sorry that I haven't had a chance to communicate with the DSPArecently, but I just have not had thetime. I know this is an excuse that ins easy to make, but I have been (and still am) heavily involved with our fibreglass submersible programme, and this has meant spending over 300 days per year away from home and working extremely long hours into the bargain.

"I will however try to do better in the future, as I'm hoping that things will slow down again soon. This is said more in hope than expectation actually,as I'm off to Norway for a month with our Lock-out submersible, commencing Wednesday next, then return for trials on L-V, and on TAURUS A, recently arrived from HYCO.

"Generally, things this side of the Atlantic are going reasonably well, still plenty of work in the North Sea, and Vickers Oceanics is also tendering for several contracts abroad, so we are hoping for a fairly good result this year.
"I have also given out several application forms for the DSPA in recent weeks, so you may shortly receive some of them back."

Mike Staehle (3/29/78)

"I left Westinghouse last August and accepted a job as the Senior Project Engineer for Mechanical Systems in the NOAA Office of Ocean Engineering, Manned Undersea Science and Technology Office. I am presently working most of the time on Project OCEANLAB which promises to be the first of a new breed of submersibles that can support the scientist in the undersea environment, where he belongs, rather than trying to conduct his studies from a surface platform with his instruments on the end of a long string. Sis you ever try to push on the end of a string? God knows man was never intended to live and work in the surface of the ocean. Why can't man accept this fact?

"Despite a lot of bad press last summer, OCEANLAB is really a very practical and much needed system. With the inheritance of a 200 mile zone around the continental margin that we, the Government, are responsible for intelligently managing, perhaps tools like OCEANLAB and deeper diving submersibles of proven value like ALVIN will be more universally recognized as a valuable asset and funded accordingly. It seems ironic that it is easier to get a new roof for the Kennedy Center than it would be to fund DEEP QUEST for a year to support marine science in the SOCAL area.

"Later on this year I'll give you all a good look, from an engineer's standpoint, at OCEANLAB, but right now there are several conceptual design options in the mill upon which the hierarchy must pontificate. Until then,Think Deep."

March 14, 1978

CONDENSED
REVIEW
OF THE MOVIE
GRAY LADY DOWN

By

Larry Megow

"Gray Lady Down" is a spectacular movie of a sea saga starring a nuclear sub (Neptune), a deep diving submersible (Snark), the Navy's Deep Submersible Research Vehicle, the DSRV, along with Charlton Heston and David Carradine, a surface ship plus a helicopter.

The plot includes a Norwegian Freighter ramming the Neptune, sending her crashing down into a subterrean canyon, 1,450 feet below the surface -- two and a half times her maximum operating depth. The collision tears a gapping hole in Neptune's engine room, but the bulkheads hold, and only the engine crew do not survive. Since the nuclear power system is fail-safe, there is no danger from radiation either to the remaining crew or to the surrounding waters.

The rescue of part of the Neptune crew by combined efforts of the deep submersible, Snark, the D.S.R.V. and the surface ship, is thrilling.

But, for us iron and steel hardware ocean engineers, Gray Lady Down is a winner because for the first time we are privileged, as guests of the U. S. Navy, to witness DSRV in action.

In brilliant live color, we can gape and sweat along with the crew as the DSRV is dropped from the belly of her support ship and dives at better than four knotts per hour.

We can also thrill at the maneuverability of the Snark. The movie Snark looked almost like the real two man Sub-Snooper built by Sea Graphics in Torrance, California.

By all means go to see Gray Lady Down, just to see the Navy's DSRV and Snooper in action. You might even enjoy the plot.

Friday, January 13, 1978

Rescue submersibles join the U.S. fleet

SAN DIEGO — Two LMSC rescue submersibles formally joined the fleet last month, ready to recover crewmen from disabled combat submarines stranded on the ocean floor.

In colorful ceremonies at their North Island Naval Air Station home port, the Deep Submergence Rescue Vehicles (DSRV) were formally accepted into the fleet by personnel of Submarine Development Group One, stationed across San Diego Bay at Ballast Point.

Designed and built by LMSC, the green-hulled craft are 50 feet long. Special Navy crews have been trained in their use and have developed techniques to rendezvous with stricken submarines and to operate the DSRVs either from surface ships or from mother submarines beneath the surface.

The DSRVs are a new concept in rescuing submarine crews and are an improvement upon the McCann Chamber, first used in the 1920s to rescue submariners.

These highly maneuverable rescue submersibles, major elements in the Navy's new deep submergence rescue system, can travel on land, sea, and air. A DSRV can be transported on its own specially designed trucks and the complete system can be airlifted aboard four C-141 jet transports. Thus, the highly mobile submersibles can provide quick, worldwide response to submarine disasters.

In operation, each DSRV is manned by a crew of four, can dive, locate and mate with a stricken submarine laying on the ocean floor at angles up to 45 degrees, can take aboard the rescuees, and can return them to the surface or the mother submarine hovering nearby, repeating this cycle to rescue others until all survivors are safe.

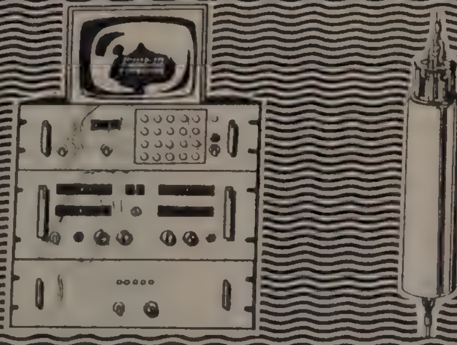
Plans for the DSRVs began to take shape after the tragic loss of the USS THRESHER in April 1963 in the Atlantic Ocean. Lockheed in 1966 won a competitive contract to design and build the submersibles. Construction of the craft was more than just building another submarine. Their development advanced the "state of the art" in many technological and operational areas and established a long list of "firsts."

Since the DSRVs were delivered to Submarine Development Group One in the early 1970s, they have undergone test and evaluation by that organization to devise and to perfect at sea the demanding techniques necessary to ensure crew rescue from disabled submarines.

april 78

Mr. Sven Rahmberg wrote from Kockums Shipyard in Sweden to say that their URF (the rescue sub for the Swedish Navy) will have trials beginning in May 1978.

Acoustic navigation too expensive for your submersible, rcv or survey vessel?



MESOTECH OFFERS A SOPHISTICATED LITTLE UNDERWATER ACOUSTIC NAVIGATION SYSTEM WITH A LOW PRICE AND IMPRESSIVE PERFORMANCE.

The Mesotech Model RR/CRT-1 system features an advanced television screen display that shows your position and your track.
Digital readouts show your range to four accoustic transponders.
A complete system fits easily into a small submersible.
Interfacing with data storage, hardware and other navigation equipment is straight forward.

MESOTECH SYSTEMS LTD.
1174 WELCH STREET, NORTH VANCOUVER, B.C., CANADA V7P 1B2
(604) 980-3474

For Dependability
in depth
think NEKTON

at 1,000 feet below the sea success depends on experience knowledge and reliability.

the NEKTON series of manned, self-propelled, portable submersibles (with a background of more than 2,300 successful dives) can handle scientific and commercial operations to 1,000 feet anywhere in the world for:

- Placement, manipulation and recovery
- Search, survey and inspection
- Video and photographic recording

..and, our unique staff of qualified experienced specialists do more than operate small submarines – we engineer solutions to your underwater operating problems.

For technical data or charter information, contact

[illegible]
General Oceanographics, Inc.
11578 Sorrento Valley Road
San Diego, California 92121
714/452-9540

*Registered Service Mark

LOCATED BY SUB OFF CATALINA

apr 78

Plane Found

By KEN MIMMS
Staff Writer, The San Diego Union

An unidentified fighter plane, probably of World War II vintage and found by a two-man submarine crew in waters off Catalina Island, may be donated to the Aero-Space Museum, according to Merle Wilson of General Oceanographics.

"If we are permitted to salvage the airplane it will be donated to the museum," Wilson said yesterday in a press conference at the company's Sorrento Valley offices.

A Navy F-6F Hellcat fighter, ditched in January 1944, was the last airplane found in offshore waters.

The 26-year-old craft was recovered from 3,400 feet of water about 12 miles off San Diego in October 1970. A month later it was turned over to the Aero-Space Museum and was lost in the Feb. 22 fire in the Electric Building in Balboa Park which destroyed the museum and the Aerospace Hall of Fame.

The latest discovery is in state waters on the west bank of the San Pedro Basin about three miles off Catalina Island. The airplane was located by sonar equipment about 4 p.m. Tuesday by the crew of the submarine Nekton Beta, owned and operated by General Oceanographics, during a routine training exercise. The find was radioed to Wilson several hours later.

The exact type and ownership of the airplane cannot be determined because the it is covered with "a considerable amount" of marine growth, Wilson said. "We know that it is a carrier-type airplane but we don't know whose.

"It has been there for a long time and except for a missing canopy and engine cowling and a slightly bent tail assembly, it is in remarkably good shape," he said. Wilson declined to disclose the exact depth of the plane.

An undersea workboat, the Nekton Beta has a depth range of about 1,000 feet. It is one of three submersibles which operate from the research vessel Seamark in undersea search and recovery operations, petroleum pipeline and platform inspections and coral reef studies, Wilson said.

Since the airplane is in California waters, the state claims ownership of the craft as "abandoned material." However, General Oceanographics officials theorized that the airplane may have been lost during the war by the Navy or deliberately crashed in the sea during a movie production.

"The Navy may want to study the effects of saltwater corrosion regardless of who owns the airplane but there is no way the Navy can claim ownership," Wilson said.

The Navy has not been officially notified of the discovery, acocording to Cmdr. John Baker, Naval Air Forces Pacific Fleet public affairs officer. "I have no idea who would have primary claim on the aircraft but the Navy will certainly look into it.

"However, until we determine the circumstances of how the airplane went into the water, I am concerned that there may be explosives aboard," Baker said.

In the absence of a "verified claim" by the Navy, the state claims ownership, said James Trout of the state Lands Commission. "However, if it is planned to salvage the aircraft for the museum, we would need assurance that it would be publicly displayed before waiving the usual state salvage royalties.

A state permit is required before material can be salvaged from state waters. The state also is entitled to royaltys based on a percentage of the assessed value of the salvaged material, Trout added.

Salvage operations could cost as much as $10,000 based on a $2,200-per-day lease rate for the Nekton Beta but excluding the cost of operating Seamark as a mother ship during the operation, Wilson said.

Bacteria buried in rocks below the ocean floor?

Rocks 10 to 20 million years old buried beneath the seafloor are populated by living organisms, say three USGS geologists. The team made their announcement after studying core samples from the U.S. Continental Shelf off South Carolina and Georgia.

Scientists F.T. Manheim, N.H. Bothner and F.A. Kohout found the bacteria living on organic matter in sedimentary rocks 300 ft or more below the ocean bottom. The organisms receive oxygen from sulfate compounds in sea water trapped in the rocks.

The scientists don't yet know how the bacteria live in the deep rocks, but they have detected bicarbonate and hydrogen sulfide waste products from sediment core fluids.

They identified similar processes in samples from a drill site 130 miles south of Nantucket Island. There the bacteria live on natural petroleum gases migrating upwards through the sediments. They claim these bacteria seem to devour most of the gas.

The team presented their findings to the Geological Society of America.

Manned Submersibles Study Cosmic Radiation Deep In The Sea

by
Robert S. Jones
Harbor Branch Foundation, Inc.
and
Dr. Peter Kotzer
Western Washington University

Harbor Branch Foundation, Inc., in a joint physics project with the National Oceanic and Atmospheric Administration (NOAA), has placed, for the first time, cosmic ray detectors on the ocean floor at a depth of 1000 feet. This experiment is but one step in a vast program to study background-free cosmic radiation to the greatest depths possible in the oceans.

Key to the success of the current missions is the versatile Harbor Branch submersible *Johnson-Sea-Link II*, which is being used to assist physicists in their undersea cosmic ray research.

This innovative experiment in elementary particle and nuclear physics is designed to study behavior of [illegible] nuclear particles that [illegible] up the enormous quantity [illegible] cosmic radiation [illegible] bombarding the earth, [illegible] as muons and neutrinos.

At the earth's surface, [illegible] radiation is so intense that thousands of muons pass, in a steady rain, through our bodies each second. However, at the greatest depths of the ocean a trillionfold fewer are believed to exist.

When sensitive detectors are prepared at the surface they record a considerable background level of cosmic radiation. This makes it virtually impossible for scientists to separate the multitude of particle tracks captured on their photographic plates at or above sea level from those found and produced at great ocean depths.

A primary objective of this research project is to actually prepare photographic plates at the experimental depth and place them on the sea floor. The layer of sea water overhead would then act as a [illegible]geneous filter to ex[illegible] a large number of [illegible]ous particles and allow the physicists to determine the characteristics of remaining particles and of those that are locally produced as they pass through the detectors. It is these particles that comprise the most interesting constituents of the cosmic flux.

The project originated in a meeting held at Harbor Branch Foundation in February, 1977 among officials of four participating organizations. Co-conveners of the meeting were Dr. Robert S. Jones, Director of the Harbor Branch Foundation's Johnson Science Laboratory and Dr. Kurt Stehling, Senior Science Advisor of the NOAA Office of Ocean Engineering.

The participating physicists were Dr. Peter Kotzer of Western Washington University, and Drs. Jere Lord and Seth Neddermeyer of the University of Washington. Proposals were completed and the mission was approved in a follow-up meeting in March.

After several months of intensive and coordinated activity among the research and engineering groups, the first cosmic ray detector was deployed on October 4, 1977. Photographic emulsions, the key detector elements, were prepared in the *Johnson-Sea-Link II* on the ocean floor, at a depth of 1015 feet off Grand Bahama Island.

Dr. Kotzer, assisted by Harbor Branch diver Richard Roesch, performed the delicate operation of preparing the sensitive emulsions. Dr. Stehling served as scientist-observer in the forward compartment and assisted by providing instructions, from a checklist, over the submersi-

Apr 78

ple's intercom system to the diver/scientist team in the darkened dive compartment in the stern of the submersible.

Once the detector was prepared and placed in a pressure-resistant glass sphere, it was locked-out of the submersible by way of an innovative technique developed by Harbor Branch Operations Director Roger W. Cook. Cook, with assistance from the Harbor Branch Foundation's engineers and technicians, designed and constructed a unique docking platform which functions similarly to that used in docking with orbiting space stations and is capable of withstanding the considerable pressures at the required working depth (over 30 atmospheres). This platform had been lowered previously to the ocean floor by the Research/Yacht *Sea Diver.*

Submersible pilot Tim Askew landed the *Johnson-Sea-Link* on the platform and mating was completed when sea water trapped in the platform chamber was vented to one-atmosphere holding tanks on the submersible. The result was a water- and pressure-tight seal between the mating flange and O-ring on the *Johnson-Sea-Link* and the mating surface on the docking platform's chamber. The small pressure differential remaining was equalized to about one atmosphere, making it possible for diver Roesch and scientist Kotzer to open the hatch and transfer the cosmic detector to the docking platform's pressure chamber. This operation itself was a record-setting endeavor in that it was the first dry transfer of a scientific package at depth over 1000 feet.

Closing of the hatch and the breaking of the mating seal signaled completion of the eleven-hour mission. The *Johnson-Sea-Link* returned to her berth aboard the tender, *R/Y Sea Diver,* leaving the docking platform and the first cosmic detector on the ocean floor. The mission had been a total success.

The mission was repeated on October 6, with pilot Jeff Prentice performing the docking maneuver. A second detector was locked out by the scientist/diver team.

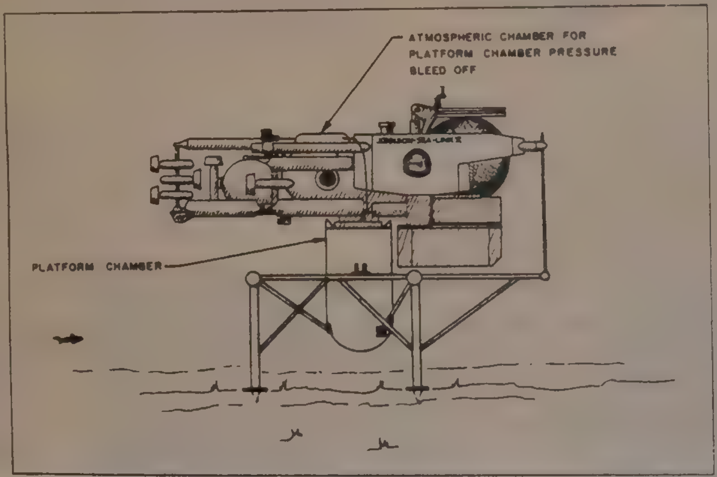
On October 7 the mission was completed when Roger Cook, as pilot, and Dr. Jones, as scientist-observer, returned to the docking platform where they used the *Johnson-Sea-Link's* manipulator arm to place a protective cover over the platform chamber's mating surface. One of the detectors remained in the chamber and the other was transported up the sloping sea bottom and placed at 400 feet.

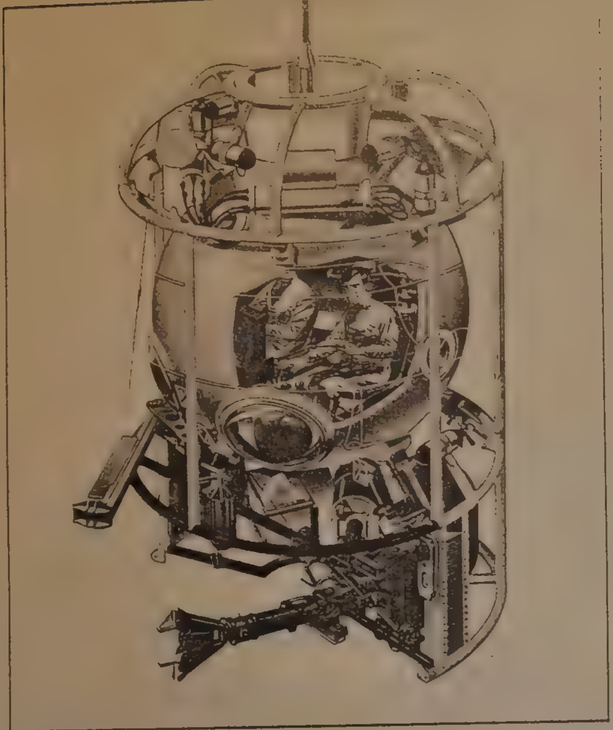
In a reversal of the deployment procedure, one of the detectors will be recovered and developed on the sea bottom this month and the other, along with the docking platform, will be recovered in October, 1978. Scientists will use computer scans of the photographic plates to recognize and analyze the tracks of muons and other interesting particles recorded in the plates.

The current undersea cosmic ray experiments sponsored by Harbor Branch, NOAA and the participating universities are expected to provide important information on radiation caused by muons and other particles to depths about 10 times greater than previously achieved. From such data, it is possible to determine the composition, energy spectra and — perhaps by inference — the cosmic origin of the particles. If successful, undersea cosmic ray physics will be greatly advanced and significant steps will have been taken toward establishment of new and basic techniques required to meet man's quest for a new window on the universe — neutrino astrophysics.

Harbor Branch Foundation, Inc. is a not-for-profit corporation established primarily for research in the marine sciences and for development of oceanographic tools and systems for undersea research. It is one of the world's leading manned undersea research centers and participates in and sponsors many diverse projects. (ST, Dec., 1975, page 22 for a profile of the Foundation.) ▷

Opposite page, Harbor Branch diver Richard Roesch, pilots Tim Askew and Jeff Prentice and Drs. Kotzer and Stehling examine "hard hat" of the type used to protect pressure resistant glass spheres housing the cosmic detectors. **Right**, schematic showing submersible and platform chamber mated for the dry transfer of pellicle plates. **Below**, *Johnson-Sea-Link II* submersible "flying" over the docking platform. The platform was custom-fabricated by Harbor Branch personnel. The actual transfer was the first dry transfer of a scientific package at more than 1,000 ft. depth.





THE $ 700.000* MONEY SAVER

1000 M BELL
1800 M BELL

Drilling Assistance

- The MOB is specially designed to provide drilling assistance in deep waters. It can be launched either through a moon pool (e.g. the MOB 1001 on the "Pelerin") or over the side (e.g. the MOB 1002 on the "Discoverer Seven Seas").

It can carry out operational missions such as

- Direct observation and TV closeup transmission of drilling operations
- Changing MW pingers
- Turning valves, hydraulically activating B.O.P. stack connectors
- Handling tools (cable cutters, rotary brushes, etc.)
- Underwater slinging jobs
- Changing AX seal.

***Savings**

Savings based on ship-operator day rate of $ 100,000. x 7 days saved in performance of specific tasks:

- Inspection of cocked Temporary Guide Base
- Location of flat bottom for re-setting TGB
- Free fall beacon recoveries
- Reentry of casing and TGB into open hole
- Bit reentry into Permanent Guide Base
- Service, recover and replace beacons on PGB
- Continuous inspection of stack and riser : surface to bottom.

These tasks were performed in 565 meters (1,852 1/2 ft.) of water during the course of 10 dives with a composite bottom time of 21 hours, 18 minutes.

COMEX INDUSTRIES also markets:

- Deep Diving Systems from 80m. down to 450m.
- Observation, lock-out and rescue submersibles
- Diving simulators and hyperbaric centers
- Design and engineering of underwater equipment
- Deep diving training

COMEX INDUSTRIES
a Comex Group Company
Av. de la Soude B.P. 143 13275 MARSEILLE Cedex 2 FRANCE - Phone: (91) 41.01.70 - Telex 410985

James Merritt Named General Manager Of Perry Ocean Products

Bruce C. Gilman, president of Perry Oceanographics, P.O. Box 10297, Riviera Beach, Fla. 33404, has announced the appointment of **James T. (Ty) Merritt** as general manager of the Perry Ocean Products Division. In his new position, Mr. **Merritt** is responsible for the development, production, and distribution of Perry's extensive line of auxiliary undersea products. These include hyperbaric lights, manipulator assemblies for undersea vehicles, hydraulic packages, lung-powered scrubbers, oxygen flow analyzers, and a variety of diver support equipment. In addition, Perry's RECON unmanned vehicle development and production programs have now been concentrated in the Perry Ocean Products Division.

Mr. **Merritt** brings more than 20 years of submersible equipment experience to his new position. With Perry for the past 10 years, Mr. **Merritt** has acted as in-plant and customer training coordinator, operations manager, and program manager for many of the company's most significant tasks. Mr. **Merritt** was operations manager for the SEAL Petroleum Personnel Transfer Bell, a program that comprised nearly 200 trouble-free dry transfers of surface crews to a subsea satellite in the Gulf of Mexico. He has been program manager for the PC14 observation submersible purchased by Texas A&M University, and Perry program manager of the joint Perry-GE Oceanlab study team under contract to the National Oceanic and Atmospheric Administration. More recently, he has been program manager for the development and production of Perry's line of RECON remote-controlled observation and light-work vehicles. As such, he has headed successful demonstration teams in such areas as the North Sea (Shell Exploration and Production).

Mr. **Merritt** is a member and past officer of the Deep Submersible Pilots Association, and has served as chairman of the Membership Committee.

Heading sensors for submersibles...

Courtesy Oceaneering International

DigiCOURSE

Model 310 magnetic heading sensors work at depths to 20,000 feet.

This optically scanned magnetic compass is designed for external installation on manned or tethered submersible vehicles. Accurate digital heading data are transmitted to locations inside the sub or on the control vessel. Gimballing accommodates ± 75° roll and ± 45° pitch.

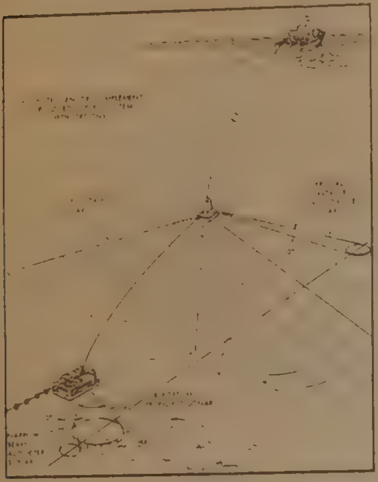
Output format is serial pulse train with a resolution of 1°. Transmitting range is 2000 feet, standard and 35,000 feet, special.

A data converter is available to interface sensor output with peripheral equipment.

Send for full specifications on this and other DigiCOURSE scientific heading sensors.

DIGICOURSE, INC.
P.O. Box 50699, New Orleans, La. 70150 U.S.A.
Telephone (504) 733-6061
Telex 58-4230 • TWX 810-951-5043

New Options will Increase Effectiveness of Deep Sea Survey System



Hydro Products' Systems Division has completed an analysis of new options that can be added to the basic DSS-125 Deep Sea Survey System to expand its current capabilities.

The DSS-125 is an advanced deep ocean television/photographic towed viewing system. It incorporates unique concepts in towed platform stabilization and underwater TV viewing. The basic system includes an instrument platform that employs a low light level SIT TV camera, two thallium iodide lamps, two 70mm still cameras with strobe lights, two high intensity spot lights, a magnetic compass and a telemetry canister that allows data and control signals to be transmitted over a single coaxial cable.

The new options would include deployable bottom marker transponders for marking location of detected objects; an internal pan and tilt/zoom (PATZ) low light level TV camera; vertical obstacle avoidance sonar; an acoustic altimeter; subbottom profiling sonar for the detection of charted objects and side looking sonar for long range detection.

Thrusters could also be added to the sensor platform to extend the viewing capabilities of the system by allowing the platform to be thrusted to the side. It will also permit a survey to [illegible] a precise line such as might be required in following a pipeline or performing an ordered search of the ocean bottom.

Hydro built its second DSS-125 System for the German firm, Metallgesellschaft. The first system is used on board the research vessel, VALDIVIA to locate and map valuable manganese nodule beds at depths of up to 20,000 feet. Since the operation of the DSS-125 is critical to the VALDIVIA's ocean mining surveys, the second system will be used as a spare or backup system.

A third Deep Sea Survey System has just been delivered to Nippon Electric Company in Japan.

Further information of the DSS-125 System and its options can be obtained by contacting Bob Melucci at (714) 453-2391.

Ocean survey firm joins forces with small submersible fabricators

Marine Unit Holdings Ltd., Richmond, UK, underwater surveyors, has acquired a majority share holding in *Cooke Brothers Marine Projects Ltd*, manufacturers of small submersibles. *Cooke's* as a subsidiary will specialize in the production of remotely-controlled vehicles.

! SCUBA EQUIPMENT RECALLED !

U.S. Divers Co., Santa Ana, California, in cooperation with the U.S. Consumer Product Safety Commission (CPSC), announced last month a voluntary recall of all its scuba regulators sold after December 1, 1976. A very substantial number of regulators in nationwide distribution is involved.

The recalled regulators may have a potentially defective clamp ring which may cause unseating of the second-stage regulator diaphram. The second stage is that portion of the regulator which the diver holds in his mouth. The unseating of this diaphram could result in the regulator being flooded with water and the air flow to the diver being cut off.

The recalled scuba regulators were sold under the name of U.S. Divers and/or the following model names: Conshelf XII; Conshelf Supreme; Calypso J; Calypso IV; Aquarius; Octopus; and Hookah. The model name and/or U.S. Divers appears on the product on the purge button. **Consumers are warned to immediately stop using these regulators.** Consumers should return them to an authorized U.S. Divers dealer for free replacement of the clamp ring. For additional information, contact U.S. Divers Co., Customer Service Department, 3323 West Warner Avenue, Santa Ana, California 92702 (714/540-8010). Information on this recall is also available by calling the U.S. Consumer Product Safety Commission's toll-free Hotline 800-638-2666. Maryland residents only, call 800/492-2937.

A New Class of Vehicles Announced by Hydro Products

A new class of unmanned remote controlled underwater vehicles, the RCV-150, is being developed at Hydro Products to perform work tasks in the rugged offshore environment in addition to observation and inspection.

The RCV-150 is a class of vehicles unique and distinct from the extremely successful field proven RCV-225 class. It will perform high quality television inspection, numerous light work tasks, and acoustic navigation. The system will be easily transported, maintained, and serviced in addition to being backed up by a responsive and professional field service capability.

Hydro has received three orders for the RCV-150 and deliveries start in May 1977. The first to purchase the new system was Martech International, a rapidly growing offshore service company based in Houston. The second RCV-150 was ordered by Deep Sea Diving Equipment of Norway, the most recent order came from Deep Sea Resources Development of Taiwan for coral harvesting.

Major elements of the system are the Vehicle equipped with Hydro's miniature, high resolution TV camera mounted on an internal pan and tilt mechanism; a control station; and a complete deployment system with a submersible vehicle launcher and tether cable winch. The RCV-150's micro computer based control and display system facilitates addition of tools, sensors, and advanced vehicle control concepts. It also continuously monitors vehicle performance so the operator is alerted to potential problem areas before they become serious. The general purpose manipulator can be used for removing debris; pulling or cutting cables; emplacing, moving, or retrieving objects weighing up to 100 lbs. in water; and for attaching messenger lines to large objects to be recovered.

Operation to 6,000 feet will allow the system to work in most offshore oil areas, including the deepest exploratory drilling operations presently underway. The system's endurance is limited only by the surface operator's. Rotation of operators allows for continuous vehicle operation to take full advantage of ship time or favorable weather conditions.

The economic value of the RCV-150 is greatly increased with the ability to add new sensors and work tools as operational requirements change. Extra payload capacity is provided by the addition of modular buoyancy elements. Reserve power and telemetry capacity is provided for a variety of additional sensors and tools.

Contact Art Sepin, Manager of Vehicle Division Sales, at (714) 453-2348 to obtain more information on the new RCV-150 class of remote controlled vehicles.

Undersea Robot Lost

An underwater robot lost about 17 miles off Point Loma was the object of a widening search by boats and aircraft yesterday.

A $5,000 reward offered by the manufacturer of the prototype vehicle, designed for working sea-floor installations in offshore oil fields, heightened interest in the search by area boaters.

Nicholas Boratynski, president of Tetra Tech Inc. of Pasadena, said the vehicle was lost Thursday evening at a depth of 2,000 feet when a cable linking the craft to a control boat on the surface parted mysteriously. The robot was built by Hydro Products of Sorrento Valley, a Tetra Tech subsidiary.

"We think there is an excellent chance of recovering it but the fog has been hampering our search," Boratynski said in a telephone interview.

"Yesterday we circulated notices of our reward offer to yacht clubs in your area in the hope that private boaters will help in the search.

"It is nearly spherical in shape, about four feet in diameter and is equipped with a flashing light, a sonar pinger and a radio transmitter which will send out a signal if it comes to the surface."

Boratynski said engineers are puzzled by the cable's parting as well as the robot's failure to appear on the ocean surface. He said it is designed to become slightly bouyant in the event of a mishap.

An intensive search by company-operated boats, airplanes and a hplicopter began Saturday.

"We call it the RCV-150 and it is specifically designed for work in offshore oil fields at depths beyond the reach of human divers," Boratynski said.

"It can make inspections of oil lines on the sea floor, tighten bolts, cut cables and other simple tasks. It is equipped with television cameras, a manipulator arm and various tools.

"Several oil companies already have ordered copies so we are anxious to have the prototype back.

"If it were not recovered, however, the negative impact on our earnings from this loss is not expected to exceed $100,000."

He said a prototype system similar to the lost vehicle is to be completed in April.

"The lost vehicle is a robot that swims underwater like a dog on a leash," Boratynski said. "Anyone who finds it should not try to lift it out of the water as that will damage it.

"They should tow it to shore or call Tetra Tech or the Coast Guard."

[illegible] [illegible]graphics has delivered its new PC180 submarine to Super[illegible] [illegible] Maritimo Ltda of Rio de Janeiro i early January. The advanced PC1803, named the SUPERSUB I, is expected to be a valuable tool in the development and maintenance of undersea oil installation off the coast of Brazil.

The craft is 24' long, weighs 13.5 tons, and can carry 4 crew members 984' below the surface. It is the fastest submersible in its class, being capable of nearly 4 knots, for maneuvering in the treacherous currents off the South American coast. The PC18 contains a diver-lockout chamber that permits its use as a submerged base for divers. Upon completeing their work, the divers can return to the pressurized chamber, be carried to the surface, and transfer to a shipboard living chamber where they can gradually decompress to normal atmospheric pressure. This system incorporates diver-suit and breathing gas heating for comfort in cold, deep water. Supplementing diver operations is a Perry Deep Submergence Work Package with 2 manipulator arms and hose disconnects for hydraulic tools.

The PC18 has advanced features that enable it to meet Superpesa's rigid mission requirements. It is designed to operate either with or without an umbilical that carries power, communications, and video lines. With the umbilical, the vessel can stay submerged for 176 hours, or as long as the onboard life support gases last. Color television signals are transported to the surface for display or real-time recording. The PC18 carries a variety of other instrumentation, including an altimeter, depth gages, life-support system monitors, current velocity meter, and directional gyro autopilot.

Apr 78

TAURUS is now in the U.K. and will be diving with the Vickers group. The people at Vickers rarely return covers, so I don't know if there is any hope there, or not.

PISCES V is being refitted and made operational in the Houston area. AQUARIUS I and the HUDSON HANDLER will be having a refit soon. PISCES VI is off on an assignment and Al will try to find time to do covers from his stack. If you get these fine...if you don't please do NOT complain. I'm taking my chances just like you.

I have a letter from Ed Bland in which he confirms that it is a new titanium FRAME for ALVIN, not hull. So, to everyone who wrote me on it....FRAME, FRAME, FRAME!!! At least I know that ONE HALF FATHOM is being read. That's one way to find out. Make a mistake.

There has been a delay in getting ALVIN back to sea. Operationsnow are expected about the end of March. Schedule now will be for a short trip to the Carribean and Ed will accept 5 covers with Bahama stamps. (Bahama now is 15¢ to U.S.) The crew will not buy any Bahama stamps themselves. You will have to do this yourself and make sure you have the correct amount on each cover. Then ALVIN will have a short period back in Woods Hole before the mid-Atlantic trip to the FAMOUS area in mid-summer.

In a change of Command ceremony held on 1-6-78 Lt. C.L. Parsons relieved LCDR. J.K.Newell as Officer-In-Charge of the Bathyscaph TRIESTE II (DSV-1).

Capt. de Guillebon also advises that the Bathyscaphe ARCHIMEDE will be out of operation until 1979 and the unmanned vehicle ERIC I is not fully operational yet.

Last month or [illegible] was [illegible]ted for the TROV-S-3 operated by McElhaney Engineering of Vancouver, Canada. Well, we received a notice from I.S.E. (International Submarine Engineering,Ltd.-2601 Murray Street-Port Moody,B.C. Canada-V3H 1X1) describing their new TREC, a second generation remote controlled vehicle from the TROV which they also developed. At this point, I am not sure of the relationship between these two firms, and if anyone can assist, it would be appreciated. They state that TROV's are now in use in the North Sea and Gulf of Mexico. The TREC was deployed and successfully operated from a platform on the deck of the AUGUSTE PICCARD while the submarine was submerged (covers?) during a trial to demonstrate the feasibility of all weather usage.

The East Pacific Rise at 21 degrees north latitude off the coast of Mexico will be the site of a major seafloor spreading study, to be carried out with the participation of Mexican scientists. The French submersible CYANA will be used in the area in 1978, and the ALVIN from Woods Hole Oceanographic Institution will be used in 1979.

One Half Fathom

Mrs. Dan J. Fager
Editor & Publisher
4004 BAY TO BAY BLVD. TAMPA, FLORIDA 33609

PLEASE ENTER MY SUBSCRIPTION TO ONE HALF FATHOM FOR 1978...11 ISSUES IN YEAR

NAME____

ADDRESS____

SUBSCRIPTION RATES.....$6.00 FOR U.S., CANADA, OR MEXICO, FEB. THRU DEC.
$8.00 FOR OVERSEAS SURFACE MAIL, FEB. THRU DEC.
$11.00 FOR OVERSEAS AIR MAIL, FEB. THRU DEC.

PLEASE ENCLOSE 15 OF YOUR OWN MAILING LABELS WITH THIS SUBSCRIPTION FORM. IF YOU DO NOT HAVE LABELS OF YOUR OWN, PLEASE INDICATE SO HERE ____ AND I WILL SEND YOU BLANK ONES TO FILL IN FOR ME. IF LABELS ARE NOT RECEIVED BY THE MAR. ISSUE SUBSCRIPTION MONEY WILL BE REFUNDED AND SUBSCRIPTION CANCELLED.

IN THIS SPACE PLEASE INDICATE NAME AND ADDRESS OF A FRIEND WHO MIGHT LIKE TO HAVE A COMPLIMENTARY COPY OF ONE HALF FATHOM DURING 1978.

____

THANK YOU. IRENE FAGER

MARINE TECHNOLOGY SOCIETY

presents the

COMPASS DISTINGUISHED ACHIEVEMENT AWARD FOR 1977

to

DR. ROBERT D. BALLARD

for services set forth in the following

CITATION

For extraordinary professional dedication, inspirational scientific leadership, and total commitment to the advancement of oceanography and ocean engineering via the extended application of manned submersibles for solving major problems relating to sea-floor geology. By making over 100 deep dives in such submersibles as the *Alvin, Trieste II, Archimede,* and the *Ben Franklin,* Dr. Ballard has been able to provide pioneering observations, measurements and analyses that have added greatly to man's understanding of sea-floor tectonics, deep ocean hydrothermal vent systems, *in-situ* sea-floor sampling techniques, and fine-grained navigation of submersibles.

His more notable achievements include:

a. Using the *Alvin* to drill holes in granodiorite and other rocks in order to date these rocks radiometrically during a geologic study of the Gule of Maine.

b. Developing a submersible navigation system that permitted use of the *Alvin* and the *Archimede* in assembling a detailed geological map of the rift-valley floor of the Mid-Atlantic Ridge, thereby demonstrating that submersible operations could provide an order of magnitude of more information than remote-controlled photography and dredging.

c. Collecting the most complete collection of rocks from the earth's mantle by skillful use of manned submersibles in the Cayman Trough of the Caribbean.

d. Observing in the Galapagos Trough the first deep-sea hydrothermal vent system and the unique ecosystem associated with these vents.

Dr. Ballard has also given generously of his time and talent to promoting team spirit, international cooperation, public presentations, and publication of feature articles—all of which has stimulated broad public interest and awareness of deep ocean discoveries attributable to the U.S. ocean science program.

Accordingly, the Marine Technology Society hereby recognizes Dr. Robert D. Ballard for his distinguished achievements in marine geology, his exemplary public service, and his catalytic influence on ocean engineering related to the use of manned submersibles.

James A. Rickard
President

MARINE TECHNOLOGY SOCIETY

presents the

COMPASS INDUSTRIAL AWARD FOR 1977

to

DEEPSEA VENTURES, INC.

for accomplishments set forth in the following

CITATION

For outstanding contributions in advancing the scientific, engineering, commercial, legal, and political aspects of marine technology by:

a. Demonstrating the technical and economic feasibility of the recovery of manganese nodules from the ocean floor through developing and testing the applicable technology without assistance from the public sector.

b. Cooperating actively in national and international efforts to ascertain and minimize early on the environmental effects of deep ocean mining operations.

c. Exercising a high degree of leadership in calling government attention to the domestic, legal, international, and political issues of deep ocean mining.

James A. Rickard
President

MARINE TECHNOLOGY SOCIETY

presents the

LOCKHEED AWARD FOR MARINE SCIENCE AND ENGINEERING FOR 1977

to

BEN C. GERWICK, JR.

for services as set forth in the following

CITATION

For demonstrating outstanding leadership, ingenuity, and engineering skills in the design of massive concrete structures for use in:

a. North Sea drilling, production, and storage platforms, including the Ekofisk Caisson, the Beryl and Stratfjord CONDEEPS, and the Ninian Central Platform.

b. The offshore terminal at Hay Point, Queensland, Australia.

and for:

a. Conceptual development, preliminary design, and construction procedures for a prestressed concrete floating terminal for Liquefied Petroleum Gas (LPG) in the Java Sea.

b. Imaginative feasibility studies proposing the use of prestressed concrete floating caissons in the future exploitation of petroleum resources of the Arctic Ocean.

c. Development of recommended practices for national and international professional bodies in the design, construction, and installation of concrete sea structures.

This award is given in recognition of these accomplishments and their importance in the growing utilization of concrete in offshore structures.

James A. Rickard
President

OFFSHORE TECHNOLOGY CONFERENCE

MAY 8-11, 1978 · ASTRODOMAIN · HOUSTON, TEXAS

MONDAY MORNING — 9:30 a.m. to 12 noon

ROOM 100 Design Procedures for Offshore Structures
ROOM 107 Marine Geochemistry
ROOM 111 Dynamic Positioning
ROOM 114 Wind & Wave Loading Forces I
ROOM 300 Pipelines
ROOM 307 Environmental Effect of Oil Spills & Production Operations

MONDAY AFTERNOON — 2:30 p.m. to 5:00 p.m.

ROOM 100 Special Offshore Structure Design Problems
ROOM 107 Hydrocarbon Potential of Frontier Areas
ROOM 111 Navigation Systems
ROOM 114 Wind & Wave Loading Forces II

TUESDAY MORNING — 9:30 a.m. to 12 noon

ROOM 100 Seismic & Cyclic Loading Considerations in Structure Design
ROOM 107 Characteristics of Deep Water Reservoirs
ROOM 111 Marine Geophysical Operations
ROOM 114 Instrumentation & Data Bases
ROOM 118 Ocean Mining I
ROOM 300 Production Facilities
ROOM 307 Platform Installations
ROOM 311 Properties of Engineering Materials

TUESDAY AFTERNOON — 2:30 p.m. to 5:00 p.m.

ROOM 100 Dynamic Response & Fatigue Considerations in Platform Design
ROOM 107 Mississippi Delta Geology & Geomechanics
ROOM 111 Geophysics — Techniques & Case Histories
ROOM 114 Data Collection & Instrumentation
ROOM 118 Ocean Mining II
ROOM 300 Corrosion Performance & Control
ROOM 307 Manned Submersibles
ROOM 311 Mooring, Anchoring, & Cables

WEDNESDAY MORNING — 9:30 a.m. to 12 noon

ROOM 100 Properties of Offshore Soils
ROOM 107 Structure & Stratigraphy of Continental Margins I
ROOM 111 High Resolution Geophysics & Seafloor Surveying
ROOM 114 Ocean Waves I
ROOM 118 Unmanned Vehicle Technology
ROOM 300 Drilling Operations
ROOM 307 Mobile Offshore Platforms, Ships, & Marine Terminals
ROOM 311 Fatigue Behavior of Components in Offshore Structures

WEDNESDAY AFTERNOON — 2:30 p.m. to 5:00 p.m.

ROOM 100 Behavior of Foundation Soils Under Cyclic Type Loadings
ROOM 107 Structure & Stratigraphy of Continental Margins II
ROOM 111 Pile Driving
ROOM 114 Ocean Waves II
ROOM 118 Diving Activities
ROOM 300 Risers & Blowout Preventers
ROOM 307 Mobile Offshore Platforms & Ships
ROOM 311 Fatigue & Fracture Behavior

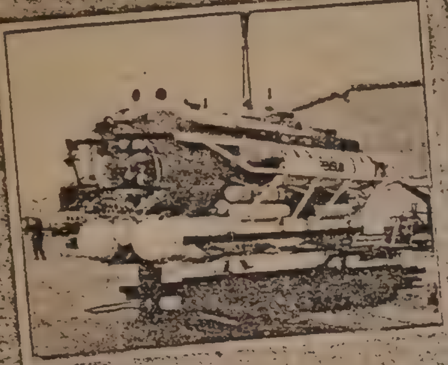
THURSDAY MORNING — 9:30 a.m. to 12 noon

ROOM 100 Pile Design Considerations
ROOM 107 Geologic & Environmental Hazards
ROOM 111 Support Vessels & Service Equipment
ROOM 114 Power & Support Systems
ROOM 118 Underwater Development
ROOM 300 Ocean Thermal Energy Conversion
ROOM 307 Offshore Processing
ROOM 311 Welding & Repair

MANNED SUBMERSIBLES ROOM

OTC	
3196	**Drilling Assistance at 3,300 Foot Depths** J. W. Woods and L. E. Billingsley, Comex Marine Services, Inc.
3197	**Design, Fabrication, and Operation of the 3000 FSW Work Submersible System** K. F. Sebok, Perry Oceanographics, Inc.
3198	**Early Operations of an Oil Field Intervention Submersible** J. B. McBeth, Intl. Hydrodynamics Co. Ltd.
3199	**A New Approach to Power Duration Problems of Small Manned Submersibles** J. L. Girard, Deep Diving Systems Ltd.
3200	**Simplifying Manned Submersible Safety Criteria** M. R. Witt, Martech International
3201	**Development of Classification Requirements for the Design, Construction and Survey of Manned Underwater Vessels** C. T. Petchel and H. M. Hsu, American Bureau of Shipping

An Overview of Submersible Activities Worldwide In 1977



apr 78

by R. Frank Busby
R. Frank Busby Associates
Arlington, Va.

The explosive growth of undersea vehicles which followed development of North Sea oil and gas discoveries of the late sixties and early seventies continues. While the diver still commands the lion's share of commercial underwater activities, the role of manned submersibles, remote controlled vehicles and one-atmosphere diving suits progressively increases.

Since the cost of oil and gas continues to soar, and the demand shows no indication of slackening, the efforts to discover and develop offshore deposits will undoubtedly continue. The market, therefore, for a wide variety of undersea work capabilities cannot help but increase.

Tabulating the worldwide inventory of undersea vehicles is a frustrating task. The dynamic nature of the field makes virtually any list obsolete by the time it reaches publication. A 1976 inventory of manned submersibles revealed some 91 vehicles ranging in status from fully operational to under construction. Operational and planned remote controlled vehicles now number over 70 (excluding special purpose military vehicles), and ten one-atmosphere diving suits have been produced, with an additional 13 or more under construction.

Manned Submersibles

The bulk of the commercial submersible market resides in the North Sea. Whereas commercial operators of the sixties offered one or two vehicles (as do contemporary U.S. operators), European submersible companies offer several. Three companies dominate North Sea activities: Vickers Oceanics Ltd., 9 submersibles; Northern Offshore Ltd., parent company of the Marseille-based Intersub, (8 operating submersibles; 2 under construction) and P&O Subsea Ltd. (4 submersibles). The investment in equipment is heavy. Vickers has five support ships, four of which are over 3,000 tons displacement. Intersub has five support ships and P&O Subsea has two, all dedicated to submersible support. Most of these support craft are capable of transporting and maintaining two submersibles simultaneously, and carrying onboard diver decompression facilities. Another European company, COMEX, has a total of five submersibles to back up their saturation diving capabilities.

U.S. industrial capabilities, on the other hand, are much more modest. Four companies are the major U.S. operators. General Oceanographics, San Diego, has three vehicles; Undersea Graphics, Torrance, California, one; International Underwater Contractors, City Island, New York, one operational vehicle and one undergoing refit; and Lockheed Ocean Laboratory, San Diego, has one vehicle. All operate primarily in U.S. coastal waters and none have penetrated the North Sea market.

A cluster of submersibles are operated from Vancouver, British Columbia: International Hydrodynamics has four operational vehicles; Can-Dive Oceaneering, one; and Horton Maritime Explorations, Ltd., one — the 93 ft. long *Auguste Piccard*.

Whereas 13 U.S. and Canadian submersibles are operated by seven companies, 28 European vehicles are operated by four. This financial commitment on the part of European operators has essentially concentrated submersible capabilities and advanced research in North Sea-bordering countries.

The size of the present submersible lease market is difficult to assess. Some indication can be obtained from the 1976 Annual Report of Northern Offshore Limited. In 1975 Intersub Ltd. operated a total of five submersible "spreads" (support ship and vehicle). Total revenues from this activity were $7.2 million. In 1976 total revenues from the same activity were slightly over $10.6 million; profits are reported as "good." No figures are available from the other major North Sea operators, but it would be safe to assume that both combined equaled, and probably exceeded, NOL's $10.6 million. From an historical viewpoint, it is interesting to reflect that the U.S. commercial submersible market — in its heyday — totalled not much more than $5.3 million over the period 1966-1970. Today the U.S. commercial market probably does not exceed one-tenth of that.

The largest U.S. submersible commitments at present are in the academic and military communities. On the academic side, *Alvin* and *Johnson-Sea-Link I & II* are the most active submersibles, the former being funded at slightly over $1 million annually by the Federal Government, and the latter two vehicles supported by the non-profit Harbor Branch Foundation in Fort Pierce, Fla. A modest sum of $200,000 to $300,000 is expended annually by NOAA's MUS&T office to lease industry-owned vehicles for various in-

-22-

vestigative programs. Submersible scientific research programs in other countries are [illegible] commitment. The Canadian Government [illegible] IV and its support ship in Victoria [illegible] Department of the Environment. The French operate Cyana through CNEXO and the Soviet Union maintains at least five for fisheries and oceanographic research.

Submersible design and capabilities reflect the re[illegible]ments of offshore customers. Vehicle depth averages ab[illegible] 1,500 ft. More than 50 percent of the vehicles built in 19[illegible] and 1977 have diver lockout capability.

(Continued on Page 46)

U.S. Navy Submersibles

Though the operating climate for military undersea vehicles is different from that of the commercial users, many of the same constraints are placed upon the military users — economic, environmental and logistic. A discussion of the undersea vehicles around the world, therefore, must necessarily include the Navy vehicles because they are national assets.

The Navy has a total of seven manned submersibles and seven unmanned vehicles in operating condition at the moment. They are based on both coasts and in Washington, D.C. Their largest concentration is in the San Diego area.

The manned submersibles include the following:

NR-1; Sea Cliff; Turtle; Alvin; Trieste II; and the *Deep Submergence Rescue Vehicles I and II,* now known respectively as *Mystic* and *Avalon.*

The nuclear-powered NR-1, built at a cost of $99 million and launched in 1969, was most recently operated in June when the late Dr. Bruce Heezen of Lamont-Doherty Geological Observatory studied the Mid-Atlantic Ridge southwest of Iceland. It has been in a restricted availability status in a shipyard since that time.

Sister boats *Sea Cliff* and *Turtle* alternate missions with each other. Their primary mission is a combination of small object location/recovery and submarine rescue. *Sea Cliff* made dives off Mexico from November 1 to December 10 doing underwater geological studies for the Office of Naval Research, staffed by Scripps personnel.

Turtle was deployed to Hawaii for the summer months, doing geological surveys and inspecting hydrophones of the Barking Sands underwater test range. She was diverted during this time for visual location of the U.S. Navy EC-130 aircraft downed in the vicinity of Wake Island.

Trieste II operated from May 30 to November 7 diving in the Atlantic making geological observations, reaching the depth of 6,159m (20,200 ft.). At the present time she is undergoing maintenance.

Both *Turtle* and *Sea Cliff* are in for some modification in the next few years to provide greater depth capability than their present 6,500 ft. The goal is for *Turtle* to have a 10,000 ft. capability by 1979, using the same sphere as is presently installed. *Sea Cliff,* on the other hand, will acquire a new titanium sphere to enable a 20,000 ft. capability, with the target date of 1981.

Alvin is owned by the Navy, and funded jointly by NOAA, NSF and the Office of Naval Research, and operates out of Woods Hole, Mass. One of *Alvin*'s more recent assignments was a cruise during the period from June 12 to September 28 doing geological/biological observation work off the mid-Atlantic states. A total of 30 dives were made. The maximum depth reached during the period was 3,648 meters (11,965 ft.), and the research was done on behalf of all three cosponsoring organizations.

DSRV 1 and 2, re-named upon their formal acceptance into naval service on December 9, are both based in San Diego. They will be taking part in "flyaway" operations three times per year when they are flown to one of seven Navy port areas in the U.S. for exercises. Otherwise, they will be standing by for the unwanted but ever-present danger of submarine accident.

The Navy also operates two *CURV 2* vehicles, one based in San Diego and the other in Keyport, Wash. They are both primarily used in conjunction with torpedo testing, for recovery of lost torpedoes. *CURV 3* is based at the Naval Oceans Systems Center, San Diego, and is used similarly. All are in continuous use, and have operated as recently as December.

RUWS, (Remote Unmanned Work System), is not fully operational as yet, and is periodically tested operationally. It is based in Hawaii. It is under continuing development, and has as its ultimate goal the capability to perform work at 6,098m (20,000 ft.)

The *SNOOPY* class of vehicles numbers two — one version recently returned to NOSC from Naval Facilities Engineering Command for needed care after two years of operational use by NAVFAC. The other one, an electric version, was last used in mid-October. It has the ability to accommodate simple attachment devices, cutters and work tools.

Deep Drone, developed to the Navy's specifications by Ametek-Straza, became operational in 1975, and is now assigned to the Supervisor of Salvage and contract-operated by Alcoa Marine, Inc. It was used four times in 1977, most recently to assist in the salvage of the sunken 41-ft. Coast Guard patrol craft, #41332, that was lost near the mouth of the Columbia River in Oregon on the night of November 15-16. *Deep Drone* was used to provide video reconnaissance of the wreck, which appeared to be intact, and to attach a lifting line to a towing bitt on the vessel's stern. As of December 15 all was in readiness for an attempt to raise the craft from its 306 ft. depth, but inclement Pacific Northwest weather was delaying further efforts. ►

st radical departure from conventional materials 's active submersibles was spearheaded by Vickers cs in their VOL-L2 and L3. Instead of steel hulls, e vehicles utilize Glass Reinforced Plastic (GRP), and ereby have increased their payloads by thousands of pounds over their steel-hulled counterparts. Much of this added payload is utilized by increasing the battery-carrying capacity and mixed breathing gas capacity to heat and support lockout divers.

Design Innovations

A design concept which has been advanced for some years has seen fruition in Perry Submarine Builders' *Supersub I* which features a detachable surface-to-sub power umbilical. The unlimited power available through the umbilical allows for a variety of lockout tasks that other vehicles cannot match, such as wet, ambient pressure welding. International Hydrodynamics/ recently launched *Taurus*, designed for dry transfer of personnel to subsea completion systems. At 26 tons, *Taurus* has no weight equal among submersibles designed for single point launch/retrieval from a conventional support craft.

Oceaneering International and COMEX have introduced a new breed of one-atmosphere submersibles designed to operate from a lift cable for maintenance and work tasks on offshore structures. What they lack in mobility, Oceaneering's *ARMS* and COMEX's *MOB 1 and 2* make up in manipulative dexterity and mid-water stability. International Contractors has introduced a concept whereby a saturation diving bell can be rapidly converted into a one-atmosphere observation/work bell by substituting a plastic viewing dome in place of the steel hatch cover which normally seals the diver entrance/egress tunnel of the DDC.

Navigation Systems

The most advanced underwater navigation systems to date have been provided by bottom-mounted acoustic transponder navigation systems. Such systems are capable of providing ± 1 meter relative accuracy. Ferranti Offshore Systems, however, reported a new record for submersible navigational accuracy by utilizing an inertial navigation system during a pipeline tie-in from one of Intersub's submersibles. During these trials a position accuracy of ± 15 cm was demonstrated, and ± 5 cm is said to be possible.

Operational Limitations

Limited electrical power and surface oriented launch/retrieval continue to be a problem for submersible operators. *Survey Sub I*'s umbilical is a solution only for open ocean diving. Where the job is adjacent to — and inside — a structure, the potential for cable entanglement is always present. A practical, reliable and economical solution for the lead-acid battery problem has yet to be employed by any commercial operator.

Vickers Oceanics advertises a Sea State 7 launch/retrieval capability; this is the ultimate of any present system. States 5 and 6 are the norm for North Sea operations. While VOL's deployment capability is substantially far beyond that of any 'sixties capabilities, it is still not an all weather system. Since platform and other structure failures are most likely to occur in the highest sea states of the winter months, the capability to deploy a submersible at any time is lacking in the commercial market.

Remote Controlled Vehicles

The most dynamic growth of any undersea vehicle capability has been in the number of Remote Controlled Vehicles. (Herein the term RCV will be used generically to describe this class of vehicles, but it should be noted that Hydro Products — in a stroke of near genius — registered RCV as their trademark.) In early 1975 there were between 10 to 15 of these vehicles. Today there are in excess of 70 vehicles either operating, under construction or scheduled for construction.

The ancestor of the contemporary RCV is the U.S. Navy's CURV (Controlled Underwater Research Vehicle) of the early sixties, and during the sixties and early seventies practical application of this concept resided predominantly in government (mainly military) activities. Somewhere in 1973 and 1974 the idea of TV-carrying, self-propelled, tethered vehicles for industrial application germinated.

All RCVs have a capability for TV viewing and video taping. Most have a manipulator and are constructed to carry 35mm or 70mm still cameras with a strobe light. Configuration, dimensions, weight, complexity and depth capabilities vary from vehicle to vehicle, as does work instrumentation and vehicle attitude monitoring instrumentation. Some "swim" out from a "clump" or cage at their working depth and operate from an umbilical to the clump. Others do not use a clump and produce sufficient power to tow the cable which is connected directly to the surface ship. Cost of the full system ranges from about $275,000 to a reported $2 million. The system consists of the vehicle; a clump (optional); umbilical cable; launch/retrieval device and cable storage winch; control/display console; and a power generator.

Two major advantages of the RCV are its safety because no human is in the water and its unlimited power, surface-supplied. The fact that the vehicle itself carries no human passengers has led to these vehicles being called "unmanned." While the vehicle is indeed unmanned, the system is not. A human is as important to the RCVs as he is to the manned submersibles, but he is on the surface instead of underneath. The point is emphasized because the human on the surface can — and does — get as weary as the pilot of a submersible. Indeed, the concentration required to control the vehicle and monitor the TV screen may be more tiring than the submersible pilot's control functions. Unlimited power does not automatically equate with unlimited operating capability unless an adequate number of trained and experienced operators are available to relieve each other at intervals adequate for a continual 24 hour operation. For this reason, the nomenclature "unmanned" vehicle is discouraged.

Those who participated or observed the manned submersible scene of the sixties feel a sense of *déjà vu* when observing the RCV explosion of the seventies. The major lesson learned by submersible operators was that they had to be transported, maintained, repaired, launched, retrieved, and tracked from a ship. The submersible was only one component of a three-part system. If the launch/retrieval apparatus or the support ship were limited, the submersible was similarly limited. The North Sea operators grasped this fact early in the game and took steps to correct it. RCV operators are now facing the same fact of life: the vehicle is part of a larger system. Operating from job to job on a new ship of opportunity necessitates a crew of opportunity. The changes of their having had experience in launching and retrieving such devices, and experience in maneuvering to maintain station above a vehicle operating in one spot or advancing at a rate of one knot or less is slim. These are exacting tasks and can mean the difference between success or failure in a mission.

Operating an RCV from a fixed, stable steel structure or from a platform tied to the structure simplifies the task, but the opportunity for umbilical entanglement is ever present. Indeed, on several occasions manned submersibles have been called in to "rescue" entangled remote controlled vehicles. (Not unlike a mid-sixties incident where divers were sent down to lead a submersible out from within a fixed platform in the Gulf of Mexico.)

The above is not meant to denigrate the role of RCVs. The work they are now doing is significant, and it is abundantly clear that their potential is almost unlimited. The intent is to introduce some of the practical aspects of RCV deployment which industrial operators face on each job. Like the manned submersible, the RCV must experience growing pains before it can establish its own niche in the inventory of undersea vehicle capabilities. One or two years of at-sea experience for an entirely new breed of underwater vehicle is hardly enough time to fully wring out all the defects.

Some trends have already developed in this new field. Two sizes of vehicles have emrged: one, a small, lightweight vehicle (e.g., Hydro Products' RCV 225, International Submarine Engineering's *TREK*, Perry Submarine Builders' *Recon III*) for observation and photo documentation, and a second larger, heavier, more powerful variety equipped with manipulators and instrumentation for surveying, such as Hydro Products' RCV 150, ISE's TROV, British Aircraft's CONSUB and Ametek Straza's *SCARAB*. As with submersibles, there is no one design that will satisfy all requirements. To employ, for example, a 2,268 kg SCARAB in a shallow-water, currentless area from a fixed platform is impractical, when a 162 kg, RCV-225 could do the job. Addressing both markets, several companies now offer two types of vehicles, one large and one small.

Atmospheric Diving System

The Atmospheric Diving System (ADS) has generically grown under the JIM-suit designation, although there are now several competitors to JIM. The concept — a diver encapsulated in a pressure-resistant suit — is almost as old as diving itself. It was not until the early 1970's that offshore oil and gas provided the impetus to further the technology that would make the ADS a practical and safe system.

Technically the ADS is a one-man submersible, but the tasks for which it is designed are those traditionally performed by the ambient pressure diver — repair, construction, manipulation, etc. All ADS's are self-powered, either manually or electrically; carry their own life support systems; are mobile and the occupant operates at atmospheric pressure.

As of September 1977 there were 23 ADSs either operating or under construction. As a frame of reference, the following, courtesy of Mr. Phil Nuytten, Can-Dive Oceaneering, describes the various ADS's new employed:

Type 1 (JIM) — Prototype JIM, cast magnesium alloy body (1 unit) Type 2 (JIM) — Modified JIM prototype, same body casting material (12 units) Type 3 (SAM) — Smaller JIM, fabricated aluminum body, reconfigured joint system (4 units) Type 4 (SAM) — Redesign of SAM 3, fiberglass body (2 units) WASP — Emp thrusters on a tubular lower body in place of articulat legs (3 units) MANTIS — WASP with no arms (1 unit)

Depth capabilities of these systems range from 450 to 900m.

Oceaneering International has, at this time, literally cornered the market on ADS deployment. No other firm, government or research institution can offer this capability.

The ADS concept seems to be heading towards a most profitable future, the reason being that it is the most practical substitute now offered for the ambient pressure diver. While these systems cannot equal the diver's manipulative dexterity or his mobility, they allow the operator to deploy rapidly, work in close proximity to the job site and offer a degree of dexterity and reliability unequalled by any other manipulative device. Equally important, no decompression is required of the operator. The financial advantage of this is seen in a recent 300m dive of JIM where six hours of working bottom time was expended. An ambient diver would require eight days of decompression; the JIM diver required none.

Undersea Work — 1977

Today's offshore work by undersea vehicles is varied, but can be conveniently grouped into three categories: observation (including photographic and TV documentation); manipulative, and measurement. In terms of division of labor, the RCV is primarily used as an observer, the ADS as a manipulator, and the manned submersible cuts across all three categories and includes the task of lockout diver support.

The newly-constructed remotely controlled vehicle TREC aboard its "Mother Sub" *Auguste Piccard* in preparation for underwater deployment in British Columbia. *(Photo courtesy International Submarine Engineering Ltd., Port Moody, B.C.)*

The nature of work conducted by the ADS closely parallels the diver and includes drilling, cutting, grinding, inspection, rigging, bolting/unbolting, and assembly. Lacking the high degree of manipulative dexterity and sensor perception which the diver can employ, the ADS has yet to perform welding or non-destructive testing. In spite of the great advances in underwater work capabilities, the ADS, the manned submersible and the RCV have made, none can match the human being's capacity for manipulative tasks.

The decisions facing today's submersible operator are formidable. Companies such as VOL, NOL, P&O Subsea, IUC and COMEX have millions of dollars invested in ships, submersibles and RCVs. The market is fiercely competitive. If one is to gain a share of this multi-million dollar market, he cannot afford to be timid with his investments in new or advanced capabilities. All major submersible operators offer lockout diving capabilities. All major diving companies have an RCV or submersible capability or both. Most companies look enviously at JIM and are seeking a competitive system. Intersub's connection with Ferranti's ± 5 cm positioning system has not gone unnoticed, nor has VOL's GRP hull with its tremendously increased payload capacity. The community is small. When one company offers something better

(Continued on page 52)

(or different) it is only a matter of days before the competition hears of it and ponders the effect on their business.

Staying ahead (or even abreast) of the competition means more investment in new capabilities. Northern Offshore Limited, for example, anticipates that its 1977 new product budget will exceed $1.5 million. Obviously, they are convinced that the present submersible market is here to stay and will expand.

The most recent research and development area for submersible and RCV operators is in underwater inspection and testing of offshore steel and concrete structures. The North Sea is proving to be even more formidable than suspected. Several fixed platforms have suffered cracked and broken structural members in the past year. The governments of England and Norway have laid down inspection requirements to which the offshore operators must conform. A British official at the Department of Energy estimates that by 1980 this inspection market will be in the neighborhood of $50 million annually in the North Sea alone. Consequently, the diving and vehicle companies operating in the North Sea are tooling up to conduct inspections and a variety of non-destructive tests. The British and Norwegian Governments provide a significant amount of money to help finance many of these ventures. Eventually, they anticipate that the technology developed for North Sea inspection will be exportable to other oil and gas producing countries. VOL's capability for underwater explosive welding was developed in this manner. There is no parallel program in the U.S.

One of the more enticing decisions facing the major submersible operators is the question of support craft. At Sea State 7 it would seem that the practical limit of surface support is reached. Simply staying on one's feet or in a bunk is a full-time task in State 7. Such seas are all too common in the high latitudes. The vehicle operator who can operate safely and effectively beyond this limit will capture a great portion of the present and future market. There is only one answer: a submerged support submarine following the concepts advanced by Kockums of Sweden or Machinenbau Gabler of Lubeck, West Germany. As far as is known no operating company is actively pursuing an underwater support platform, but the time is approaching where someone will bite the bullet (at somewhere between $25 to $30 million) and commit the funds required. The U.S. Navy has shown that it is technically feasible to equip a large submarine with provisions for deploying a small submersible while submerged.

ALL SOLID STATE

KILOWATT AMPLIFIERS

AUDIO TO ULTRASONIC
LINEAR AND SWITCHING TYPES
HIGH RELIABILITY
FOR DRIVING UNDERWATER TRANSDUCERS

Power Ratings from 500 W to 100 KW
Full rated KVA into reactive loads down to ZERO p.f.
For submarines, standard racks, and portable use.
SHORT-CIRCUIT PROOF — FAIL SAFE
Send for Technical Memos and GSA Catalogue

INSTRUMENTS, INC.
3432 Midway Drive, San Diego, CA 92110
(714) 223-7156

SAM Type 1 aluminum prototype vehicle, 225 m (738 ft.) capability, which preceded SAM Types 2 and 3, fiberglass vehicles capable of 605 m (1984 ft.), which are under construction. SAM Type 1 has been used by Oceaneering International for diver-oriented work. (Photo courtesy of Can-Dive Services, Ltd., North Vancouver, B.C.)

The technology is also available to lock out a diver, a JIM-type suit or deploy an RCV from the same submarine whenever and wherever needed. The operator who can offer such services year-round, regardless of weather, cannot help but succeed.

Oddly, the U.S. Government, in spite of its general lack of interest in supporting commercial undersea vehicles and work capabilities development, is pursuing this goal. NOAA's Manned Undersea Science and Technology Office is in the design stage of *Oceanlab*, a mobile, self-contained habitat. While not solely directed at industrial applications, *Oceanlab*, when finished, could serve to reveal many of the operating and technical problems a large support submarine would have to face.

The fact that most of this discussion has centered on the industrial role of undersea vehicles is neither by chance nor ignorance of the activities in the military/academic field. It is simply because that's where the market is. Submersibles were almost an historical curiosity until the advent of major investment in offshore oil and gas. RCVs were virtually restricted to government use, and proponents of JIM could hardly gain an audience until the offshore market (thanks to the OPEC rate increase) mushroomed in the 'seventies. The foreseeable future of manned and remotely controlled vehicles is inextricably bound to the development of offshore oil and gas. ►

NAVSTAR: Three Dimensional Satellite Positioning With Ten Meter Accuracy

by **Larry L. Booda**
Editor

It was Sputnik I, in 1957 the world's first satellite in orbit, that made it possible for the United States to develop the first satellite navigation system, generating position fixes to an accuracy of 150 meters (500 feet). From observations made of the Russian satellite a U.S. operational system was developed and deployed. Now a second generation is under development.

Sputnik's telemetry was monitored by two scientists of the Applied Physics Laboratory of Johns Hopkins University. They discovered that the doppler shift in its radio signals enabled them to compute its position accurately.

In subsequent brainstorming they reasoned that if the satellite's position could be derived from a known surface location, why couldn't the opposite be possible — a surface fix be derived from a known satellite position?

Soon the Navy was interested, and in December, 1958 APL was awarded a research and development contract for what became known as the *Transit* system, with the U.S. Navy as the sponsor. The first satellite went into orbit in April, 1960. The system became operational with a six satellite constellation in 1964.

Today *Transit* is in worldwide use, with receivers on the ships of many countries including those of Russia and the People's Republic of China.

NAVSTAR

The Joint Chiefs of Staff Master Navigation Plan of 1971 called for navigation accuracy of 18 meters in three dimensions and an all-weather, continuous, worldwide system. The JCS supported the soon-to-be completed low frequency worldwide *Omega* system (see page 14); Loran-C (see page 14) for the extended coastal confluence zone coverage, Loran-D for short range tactical use and an advanced satellite system to provide the three dimensional capability.

A test satellite of the NAVSTAR system is shown mounted for extensive testing in a space simulation chamber. NAVSTAR will feature 24 satellites in three orbital planes each separated from the others by 120 degrees.

That last system, based on satellites, has been named *NAVSTAR*, is now under development under the auspices of the U.S. Air Force.

Leading to *NAVSTAR* was the Navy's *Timation* program, begun in 1964 and designed to offset some of the limitations of *Transit*. It advocated a system of nine satellites in each of three medium altitude orbits for a total of 27 satellites.

In 1967, the Navy launched the experimental satellite *Timation I* to demonstrate the feasibility of the system. Receivers were placed on aircraft, trucks, and a boat, and two-dimensional accuracy of 100 meters was obtained. Use of this technique to transfer time was verified to one-millionth of a second.

Timation II was launched in 1969. It used two different radio signal frequencies to reduce errors caused by the ionosphere and an improved clock for increased stability and synchronization. Tests demonstrated two-dimensional position accuracy of 50 meters under conditions similar to *Timation I* and instantaneous two-dimensional positioning within 70 meters.

The effort demonstrated that the clock was stable and could be synchronized from the ground. Also, time transfer experiments were carried out. The Navy also developed user-related equipment and assembled four tracking systems to monitor the satellites.

In 1964, the Air Force Space and Missile Systems Organization (SAMSO) also began work on a satellite navigation system, including studies and laboratory tests to develop a practical system. A 1967 mission analysis by the Aerospace Corporation of El Segundo, California, and SAMSO analyzed satellite navigation for jet aircraft. This was a critical aspect of any new system, since *Transit* could not provide the desired accuracy for jets.

The resulting report identified satellite navigation as the best approach. It stated that accuracy of about 18 meters was achievable with then current technology. SAMSO later awarded two contracts of about $500,000 each in May 1968 to TRW Systems and Hughes Aircraft for system formulation and design work. In January 1969 they submitted reports which SAMSO used to finalize a Concept Formulation Package/Technical Development Plan. The plan advocated using a 621B satellite navigation system.

During the first half of 1969, SAMSO awarded several study and feasibility contracts in areas, such as optimization of user equipment for cost savings, building breadboard models of receivers and transmitters, integrating 621B into existing aircraft avionics, and the impact of 621B on naval fleet and air operations. From 1969 to 1972, SAMSO made many studies to investigate 621B.

Single-channel and multichannel receiver tests were made at White Sands Missile Range to confirm performance of the proposed receivers. Results proved that position-fixing to 5 meters and velocity to 0.3 meter per second were attainable.

In 1970 work on an area coordination paper (ACP) to review all navigation systems and relate them to each other according to cost and need was begun. A development concept paper (DCP) to show the merit and cost of a satellite system was begun concomitantly.

The ACP was approved in January, 1973 and updated in December of the same year. Its recommendations centered around possibly reducing the number of navigation systems to reduce costs; investigate the options of global systems, deployable and mobile systems and self-contained systems; and establishment of a navigation focal point in the Office of the Secretary of Defense.

The DCP was delayed due to internal disagreements but was finally approved in April, 1973. The Air Force was assigned responsibility for development of a Defense Satellite Navigation System. A joint Army, Navy, Marine Corps and Air Force program office was established at SAMSO in June, 1973.

The project was to include the joint service requirements and some aspects of the Navy's *Timation*. Thus the main task was to consolidate Navy and Air Force programs. That same month two contracts for defining the user equipment and the control systems were awarded to General Dynamics-Magnavox Research Laboratories and TRW Systems, Inc.-Philco Ford. One of the teams was to be awarded the contract for developing user equipment and control systems.

In November the system was named the *NAVSTAR* Global Positioning System. It was to combine the best aspects of *Timation* and 621B. The orbit configuration was patterned after *Timation*, which, unlike 621B, provided worldwide coverage without foreign ground stations. The satellite signal was based on 621B.

The Defense Systems Acquisition Review Council (DSARC) recommended this approach: evolutionary development; four years to validate the concept, or Phase I; some operational testing; subsynchronous operational satellites; a cost of $150 million for Phase I; and carryover of experimental hardware to system development.

The first Request for Proposal (RFP) for space vehicles was issued in January, 1974. Four proposals were received. The contract was awarded to Rockwell International in June, 1974. RFPs for user equipment and control system were issued to the two definition contracting teams in April. General Dynamics/Magnavox received the contracts for the two segments.

Separate RFPs were issued for the manpack and the high dynamic set in June, 1975. Texas Instruments, Inc., won both contracts.

Undersea waves may cause waste disposal problem

Deep below the surface of the Gulf of Mexico waves roll in and break against the Texas Continental Shelf. These waves may have a serious impact on waste dumping and drilling practices in the Gulf.

Texas A.&M. University scientists discovered the waves while operating in the research submarine *Diaphus*. The researchers used dye markers to show the waves which are thought to be caused by differences in water density and currents.

The submerged wave layer may pose a problem in drilling disposal procedures. Regulations require drilling companies to shunt wastes to within 10 meters of the bottom. If the waste should enter the wave layer, it will be trapped and not diffuse through the water column.

Research will determine how long the waste will remain in the layer. A $2 million project is underway to furnish data on bottom conditions and life.

Organizing for ocean problems

Secretary of Commerce Juanita M. Kreps has announced approval of a plan to reorganize the National Oceanic and Atmospheric Administration.

As a result of the reorganization four new or upgraded offices will deal with special problem areas:

1. An **Ocean Management** office will plan for ocean use and evaluate ocean project proposals.

2. A **National Climate Policy** office will deal with draught, weather modification and the ocean-atmosphere weather interface.

3. **The Marine Mammals** office will deal with marine mammal and endangered species protection regulations.

4. An **Ocean Minerals** office will help manage a national program for deep ocean mineral resources development.

The plan will equip the agency to meet its responsibilities for ocean use and resource management and for climate and weather modification.

System Description

In its test configuration *NAVSTAR* will have six satellites in subsynchronous 12-hour circular orbits at an altitude of 10,000 miles in a single orbital plane.

When the system becomes operational about 1984 the configuration will be subsynchronous in three orbital planes separated by 120 degrees at 63 degrees inclination with eight satellites per ring for a total of 24.

Each satellite will weigh approximately 800 pounds. Each one will have eight major subsystems: navigation; telemetry, tracking and command; reaction control; orbital injection; structure; electrical power; thermal control; and attitude and velocity control. Phase I satellites will have a rubidium atomic clock accurate to 1 × 10^{-12}. Operational satellites will have cesium atomic clocks accurate to 0.1 × 10^{-12}. Electrical power will come from batteries and solar panels. Navigation antennas will be shaped beam helix array and the telemetry antennas will be omni-directional. The downlink navigation frequency bands are L_1 1575.42 MHz and L_2 1227.6 MHz.

NAVSTAR applications will include: precision weapons delivery; enroute navigation for land, sea, air and space; photomapping; geodetic surveys; tactical control on land, sea and air; air and surface traffic control; and range instrumentation.

Typical user sets are the portable manpack and the high dynamic. In general the receivers will run from relatively low cost up to $30,000. They will feature an antenna, L-band receiver, processor and display.

The manpack, much like a walkie-talkie, will be 4″ × 3″ × 10″. The aircraft high dynamic model will be 5.75″ × 6″ × 9″.

On being activated the user's set will automatically select the four satellites most favorably located, lock on to their navigation signals and compute th approximate range to each. It will then form four simultaneous equations with four unknowns: the three coordinates of the user's position and the clock-bias factor. A small computer in the set will solve the equations for the user's actual position and the time, and determine his velocity.

The launch of the first of the test configuration satellites is set for sometime this year, with all six planned for 1980. ▶

World's Largest Concrete Sphere May Serve As Offshore Platform For Full-Sized OTEC Powerplant

U. S. Department of Energy plans include designing the world's biggest concrete sphere in its quest for new sources of electricity to power the nation's industry and homes. The enormous spherical vessel, measuring more than 300 feet in diameter and displacing 300,000 tons, will cost an estimated $200 million to build. When and if completed, it will serve as an offshore platform for the nation's first full-sized OTEC powerplant.

OTEC, or ocean thermal energy conversion, promises to produce electricity from differences in ocean temperatures between surface and deepsea water. The method uses warmer surface water of 70°F to boil ammonia. Ammonia vapors expand to drive a turbine generator. Vapor then condenses back to liquid after being subjected to 35°F deepsea water.

Among energy-seeking scientists, the OTEC idea is actually old hat, having been first thought up by a French engineer in 1881. Later, OTEC electricity was generated near Liege, Belgium, in 1928, using cold river water, and water 20° warmer from a local blast furnace. Off the Brazil coast in 1934, history's first oceangoing OTEC powerplant went into operation for a short period of time.

Since then, a major hurdle for OTEC engineers has been designing an oceangoing vessel capable of withstanding heavy 60-foot seas; remaining afloat and motionless 40 years; and keeping bouyant under the staggering weight of a steel or concrete cold-water pipe reaching a half mile into ocean depths. Designers of the new concrete ship—more precisely called the tuned sphere—are confident that OTEC problems will be solved.

If selected, the tuned sphere—housing the world's first 100 MWe OTEC plant and producing enough electricity for a small U.S. city—will be situated off the coast of Florida, Louisiana, or Hawaii, three locations where ideal water conditions have been found.

Developers of the spherical-hulled deepsea vessel, Tuned Sphere International, Inc., a subsidiary of Energy Systems Corporation of Nashua, N.H., said Energy Department marine experts found their designs "showed excellent seakeeping responses as compared with other OTEC platform designs. Hull motions induced by waves, for example, were smaller, and the tuned sphere was superior to all candidates in heave and comparable to them in pitch."

In addition to the giant sphere, the U.S. Department of Energy is studying ships, spars, and semi-submersibles as possible OTEC housings.

M. Rosenblatt & Son, Inc., marine engineers and naval architects, was named by the U.S. Department of Energy to undertake further engineering development of the tuned sphere and spar.

Kenneth E. Mayo, Tuned Sphere International president, said: "The U.S. Government's endorsement of the tuned sphere will be of great value in helping to win acceptance of the unique vessel for this and other applications. We see great potential for our tuned spheres as maneuverable deepwater storage and transfer terminals, as deepwater oil production platforms and terminals, and as LNG processing facilities.

"In offshore mining, tuned spheres can also play an important role," he added.

Within the past 12 months, Tuned Sphere International received federal grants and contracts totaling more than $200,000 to demonstrate tuned sphere stability under all sea conditions.

Ecologically, Mr. Mayo said, "OTEC plants will consume no natural resources as in burning coal and oil, and draw on ever-present, renewable energy sources. Furthermore, OTEC plants will be located offshore well beyond coast lines."

by Tom Pickens

Saving the imperilled depths . . . and us.

Consider the word Ocean.

It evokes an image of a bright and gleaming expanse of waves and a subliminal notation of swirling fish.

Now consider a second image of Ocean. A black and lifeless mass of slop, licking at a dead shore. Nothing living moves anywhere.

It is this second vision which haunts the thoughts of scientists around the world. There is a good chance it could come to pass within the next half century.

The author of this dismal scenario? None other than Yves Jacques Cousteau, inventor, explorer, entrepreneur and poet of the seas. And surely this is a bleak vision to emanate from him. For a quarter of a century, Cousteau's ship, the *Calypso*, has been prowling the seven seas capturing the imaginations of armchair adventurers and romantics around the world. For years, his films have celebrated the wonders of the sea. Even now, the *Calypso* is sailing the Aegean on a quest to bring a gleam to the eye of any romantic: a search for the origins of the legends of lost Atlantis.

There is a startling contrast here between the adventure of a quest for Atlantis and the Dante-like vision of a dead Ocean, but, more and more, Cousteau's attention has turned away from the blue frontier he himself pioneered to confront this bleak premonition. For it is Cousteau's opinion that the world is on a collision course with a worldwide ecological catastrophe. Make that Catastrophe with a capital C. At one point he envisioned a Catastrophe so bad it would leave about 25 million survivors clustered on hilltops trying to get oxygen from the few remaining forests. No one would be able to get within 50 miles of an Ocean because there would be no oxygen there. The man who once proposed . . . quite seriously . . . that humans could one day adapt their vestigial gills to breathe in the sea, without even using diving lungs, now thinks there may be nothing left to breathe.

So, while the *Calypso* presently knifes through the waters of the Aegean seeking Atlantis, there's a good chance her white-haired skipper may not be aboard her. More than likely he will be out in one of the political forums of the world, sounding the alarm and trying to bring a halt to the destructive practices that are destroying the seas.

As a result, Cousteau has embarked on what may be his greatest quest of all, nothing less than an all-out campaign to save the Sea. He drives himself at a feverish pace, restlessly circling the globe, winging to Geneva to attend an international conference on the law of the sea, returning to New York to hold a press conference at the United Nations (arguing against the 200-mile limit), testifying before the California State Assembly's Resources and Land Use Committee, then doubling back to make a television appearance.

On screen he is all Gallic charm. Off screen he is intense and preoccupied, even a bit crusty. He often turns away from a conversation and stares off grimly, as if he were imagining the ravages taking place in the sea at that very minute. And wherever he goes his message is always the same: the ocean is an endangered body, and because this is so, *we* are an endangered species.

"The situation calls for surgery, not medicine," says Cousteau. "We are engaged in a race against time . . . *what is at stake is the survival of mankind.*"

"In the last 20 years, our team of underwater explorers has observed a constant deterioration of the sea water and a substantial reduction in the abundance of marine life."

A year ago, he founded the Cousteau Society, a non-profit organization dedicated to improving the sea and in so doing to protecting and improving all of life. The society intends to provide funds for scientists doing basic research and to act as educational and communications center. (By way of amplification, it should be noted that Society funds are *not* used to underwrite the explorations of the *Calypso*. This is covered by the revenues of television films and royalties from books and diving gear.)

Cousteau hopes his society can draft a long-range blueprint for saving the sea. It will encompass the development of alternate energy sources, support for an International Ocean Authority, and the prevention of pollution at its point of origin, rather than the expensive purification of bodies of water after they're already polluted.

The rapid growth of the society has already triggered feasibility studies aimed at developing new research centers sponsored by the society. Right now, the society and the city of St. Petersburg, Florida, are evaluating a proposed facility which would serve as a pollution-free example of how public buildings should really be put together. Entirely powered by solar and wind energies, the envisioned facility would include laboratories, libraries, museums and docks for research ships. Its purpose for being would be to serve as a sort of "think-tank" where data from all over the world on the condition of the ocean could be evaluated and correlated. The facility would have a prototype system for providing tertiary purification for all liquid effluents. And if it becomes reality, it won't be a moment too soon.

Addressing the Remote Sensing Symposium at the University of Michigan, Cousteau pointed out that we could get a preview of what we can expect to happen to the Oceans at large with what is happening to the

Photographs courtesy of the Cousteau Society

A watchful Cousteau and pilot prepare the unearthly Diving Saucer for a plunge to the darker fathoms of the world; fathoms never before accessible to us; beautiful depths that reveal ominous new threats to the sea world . . . and our own.

Mediterranean Sea and what has largely already happened to the Black Sea. The Black Sea is connected to the Mediterranean by a narrow and shallow neck, the Bosphorous. The Black Sea is already so polluted that all the water below the level of the Bosphorous is called "azoic," that is, practically dead and able to support only viruses and bacteria (azoic can also designate of the older Pre-Cambrian Era, before life appeared on earth). The surface waters, renewed only by the small quantities that come through the Bosphorous from the Mediterranean, are poor and increasingly polluted.

The Black Sea is a scale model for what is happening to the Mediterranean itself, because the Mediterranean like the Black Sea,is a large basin connected to a larger body of water by a shallow sill, in its case Gibraltar. In the Mediterranean, all the water below the level of the Gibraltar Straights is not renewed, and it is being used as a catch basin for urban and industrial wastes for Southern Europe, the Near East and North Africa. It is on its way to rivaling the azoic conditions of the Black Sea. "If nothing drastic is done soon, the inevitable fate of the Mediterranean would be death," says Cousteau.

"What is happening far away from the United States is not merely a local disaster," said Cousteau. "The Mediterranean has always been considered properly by oceanographers as a 'scale model' of an ocean, practical to study and indicative of what is to be expected in the open sea. If this is true, the sickness of the Mediterranean must be considered as an early warning of the inexorable manmade threat to mankind that is about to boomerang out of the oceans."

The destruction of the Sea is accelerating at such a pace that it's a major tabulating job just to list all the sources of that destruction. Pollution is the fetish word that evokes an immediate angry response, but according to Cousteau, "The deterioration of the Oceans is due at least as much to mechanical destruction as it is to pollution." Cousteau points to destructive fishing methods, careless coastal and harbor developments and landfills as part of the physical deterioration.

Cousteau can wax eloquent over the ravages wrought by King Bulldozer. "The recent butchering of Florida's coast by bulldozers is the best example of the disaster threatening all the American littoral zones in the very near future."

Why does he label it disaster? "Because the coastal waters are the most productive and most vulnerable," he says. "It is in this narrow river of life that fish come to lay their eggs." People who think of the ocean tend to think of it as teeming with fish from shore to shore. This is not the case. Only about four percent of the ocean is actually productive, and it is these productive areas that are the most threatened because they lie along the coasts.

"The importance of coastal waters as a feeding and spawning ground is enormous and disproportionate with the very small volume they represent in the ocean's total volume. Carving the coastlines with earth-moving equipment, creating basins and channels in order to increase the coastline,is a catastrophic solution, as it destroys, sometimes forever, the complex biological network we have to protect."

Cousteau quite obviously feels that the answers we get to the problems we've got will largely depend on where we choose to invest expenditures for the future. The wheel is spinning, and whether we survive or not depends on which color we place our bets on. This is underscored by his attitude toward that great panacea of the present political climate, drilling for offshore oil.

Cousteau is not opposed to offshore drilling per se. The man who pioneered "saturation" diving techniques to allow man to work on the floor of the ocean efficiently simply has too much respect for the calibre of work that can be carried on beneath the sea. "Offshore drilling is viable if the responsibility for safety precautions is *not* controlled by the oil company," he says. "But what's the point? Spending money drilling for oil offshore doesn't get us any closer to solving our *real* long-term energy problems. I'm certainly not in favor of spending money on offshore drilling unless its done *along with* a long-range plan to develop alternate energy sources. That oil out there should be used only as a bridge to sunpower."

Cousteau wants to see more funds earmarked for the development of Alternate Energy sources that would tap the solar power of the sea. He doesn't understand why more money has not been invested in the development of the Ocean Thermal Energy Convertor (OTEC), a floating device which utilizes a thermal engine operating on the temperature differences between surface water and deep water to generate electricity.

"If you can make it competitive economically, it is certainly preferable to almost any other energy source you can name because it is almost completely pollution free. And the source of supply is almost inexhaustible. If you could harness only one percent of the heat energy in the straits of Florida, you could supply more than all the energy presently used in the United States."

Cousteau's imagination has also been captured by another research program sponsored in part by the United States Coast Guard. Cousteau first heard about it at a marine technology conference in Monaco. Basically, the

From the fair Calypso, *salty Jacques and son Philippe consider the dive UP in a helicopter used for scouting out diving locations.*

program consists of growing kelp on giant frames floating offshore.

"The product you get . . . kelp . . . can be used in three different ways," says Cousteau. "First, it can be used to feed cattle. Second, it can be used to produce chemicals. Third, if you decompose kelp in bacteria, you produce methane gas, a sure-fire energy source and one of the major ingredients in natural gas."

"Why somebody isn't spending more money to fund this program I'll never understand. You produce *both* food and energy. And kelp is an incredible substance. It grows two to three feet a day . . . *every* day. You can harvest it every two to three days and produce millions of tons of material: 93 percent of the energy kelp stores can be converted to methane! One of the scientists working on the program estimates you could supply half the requirements of the current American energy demand from the kelp you could grow in an open area of the ocean measuring 400 miles by 400 miles.

Cousteau at 62 hasn't even started to slow down. He still makes as many as four dives a day and he says, "If anything, I'm a better diver than ever because I have more experience. My father didn't even make *his* first dive until he was 65 and he lived to be 92."

Cousteau in person does not look to be the stuff of which adventure is made. He is markedly thin and his sharp features have something of the hauteur of an Egyptian king's mummy and not much more flesh. None of which seem to affect his stamina or vitality at all. His daily schedule of appointments would be enough to tax the strength of a buffalo, yet Cousteau seems to thrive on it (interviewers are likely to find themselves shoehorned into a taxicab trip to the airport if they're lucky enough to get to see him at all); and when he takes off, he leaves a wake of exhausted associates behind him.

The man who opened the frontier of the Sea originally trained to be a pilot in the French Navy. A savage automobile accident put him in the hospital for nine months, and when he was finally discharged, he was restricted to conventional sea duty. He thinks now it may have been the luckiest break of his life. Cousteau's squadron was virtually annihilated during the early days of World War II.

After the fall of France, Cousteau joined the Resistance. It was during this period that he tested out the Aqualung, practically under the noses of German occupation forces. "The Germans didn't have any interest in swimmers as long as the swimmers weren't anywhere near their naval vessels," he recalls.

Cousteau made the first practical application of the Aqualung immediately after the War. He and his associates cleared mines from French harbors. At one point, they were scraping algae and mold off some cylindrical objects that proved to be super-sensitive German mines which could be set off by pressure waves, vibrations or magnetic force. Since the magnetic field around an Aqualung is approximately ten feet, it is nothing short of miraculous that Cousteau is even around today to defend the sea.

Cousteau is not without his critics. There are some unkind enough to suggest that he is too much a showman and too little a researcher. The scientific director of a large American corporation says, "There are plenty of oceanographers in laboratories all over the world who are doing more important work than Cousteau, and you never even *hear* about them."

Perhaps, but if Cousteau's voice is the one that is being raised, he is at least able to speak with an authority he has won on merit. Consider: there are an estimated 14 million divers in the world today. Once there was one, Cousteau himself. It was he who, with fellow countryman Emile Gagnan, invented the Aqualung and perfected it, thereby opening up the blue frontier of the sea for all of us. It was Cousteau who first celebrated the almost poetic quality of free diving, where for the first time men swam with the freedom of fish. It was Cousteau who developed the first underwater television camera. It was Cousteau who developed the "Diving Saucer," a beautiful little submarine that looks like it flew in that morning from Mars and which makes it possible for men to maneuver and photograph at depths of up to 1,000 feet. It is difficult to underestimate the impact of Cousteau's early films. Critics enthused over the beauty and eerie wonder of the underwater world revealed in them.

Cousteau's Conshelf projects in the 1960s verified the theory of "saturation diving" and proved that man could live and work in underwater habitats for prolonged periods of time without returning to the surface. The Conshelf projects were, as they say, a turning point, paving the way for possible "colonization" of the great ocean depths.

All of which is by way of saying that if somebody is going to play Champion of the Sea (and somebody had better) few people are in a better position to play Paladin, the saviour, than Yves Jacques Cousteau. His name carries clout. Even the dullest political hack has heard it. When Cousteau enters the lists to clank antlers with the fishing lobby or the petroleum lobby, you are at least inclined to pay attention to what he has to say. He speaks from first-hand knowledge of things he has seen himself.

The Antarctically snow-encrusted Cousteau captains his research vessel, the Calypso, *during the '72-'73 expedition to explore the South Pole and measure pollution. A film feature of the journey,* Voyage to the Edge of the World, *will be released nationwide this year.*

And his critics may be viewing him unfairly. Certainly, nobody has a greater respect for the disciplines of science or the benefits of pure as opposed to applied research.

Almost nostalgically, Cousteau notes, "The golden age of American research extended from World War II to 1968. The country is still thriving from the enormous amounts of basic data accumulated during those years. In 1968, the Johnson Act ended the harvest by dramatically curtailing the funds of military origin. The decision set a utilitarian trend almost exclusively in favor of applied research. The trend became a fashion. Scientists of all nations were converted into accountants. Nothing can be done today without a 'cost-benefit,' analysis."

If you want to get Cousteau angry, start talking about the glories of cost-benefit analyses. He still remembers, with special horror, the cost-benefit analyses done on the Santa Barbara oil spillage disaster. Cost figures had been tagged to every single piece of reported damage to prove that the benefits of careless offshore drilling outweighed the cost of the accident. Cousteau hit the ceiling about the time he realized that this Triumph of Accountancy had attached a price tag of one dollar on every lost sea bird.

"How can you attach a price tag to life?" explodes Cousteau. "How much for an extinct species? How much for the Blue Whale? *Are we going to put a price tag on my three-year-old granddaughter?"*

"We must decide to prevent instead of cure," says Cousteau. "As far as industry is concerned, this means putting zero level of toxic materials into the water." When Cousteau says zero, he means zero. He has frequently stated that he feels the water going out of a factory should be good enough to serve in the company cafeteria. He feels the cost of such elaborate purification should be split between the industry concerned and public funds. And he feels that such investments would pay off in public benefits — commercial fishing and new recreation — anyway.

"As far as urban wastes are concerned, severe regulations concerning all domestic products, including detergents and pesticides, could turn them into biodegradable effluents, and by dispersing these waste waters in large areas of the Sea, it would be possible never to pass the limit of the Ocean's self-cleaning properties.

"Selling shells and bleached pieces of coral should be prohibited, to stop the destruction of hundreds of miles of beautiful reefs by divers using crowbars. Selling tropical fish for home saltwater aquariums also should be prohibited, as most saltwater fish do not reproduce in captivity and can only be supplied by depleting entire reef populations. For one fish sold, more than ten die after capture or transportation. Spearfishing with or without scuba gear should be totally prohibited, as well as collecting lobsters or crabs by hand."

Much of the destruction of the sea can be attributed to ignorance, in Cousteau's viewpoint. You get the impression he'd like to say stupidity. He settles for ignorance. For too many years, people have regarded the sea as a limitless expanse of powerful force (an illusion easy enough to come by when you're standing on the shore looking out over a thunderous surf). Today we know better, and our knowledge is illuminated by those pictures taken from orbiting mooncraft of this little blue bauble of a world hanging out in space. "The sea is not limitless and deep. It is a very small coating on our planet," says Cousteau, and then he holds his fingers up till the merest slit shows, "*that* thin. But people still *act* as if the sea were boundless. To cope with this ignorance, we need a massive educational program at all levels to teach people how fragile the sea really is and how everything in it reacts, and most importantly, how *we* depend on the sea. If we poison the sea, we poison ourselves!" When Cousteau says education at all levels, he means all levels, and he can quickly catalogue a long list of opportunities, everything from schools (obvious) and museums (obvious) to rock band songs and musical formations (not so obvious).

Cousteau argues long and hard for the establishment of an international High Ocean Authority which would establish ecological constraints and rules.

"Today, nations are in competition, and competition has an element of destruction about it," he says. "Each country makes its own rules. A country *cannot* penalize its own industry with ecological constraints without jeopardizing the balance of payments. So they don't. It's that simple. You need an international authority to establish rules. *We must develop a new global consciousness to motivate us to make the necessary sacrifices without delay."*

Addressing the Remote Sensing Symposium at the University of Michigan, Cousteau summed up by saying, "There are only two logical attitudes for us today: either to have a wonderful time . . . to consume and burn everything, and *'Après moi le déluge,'* or to take up the four-billion-year challenge of trying to keep our species alive as long as the earth will offer acceptable conditions, and to organize the world along non-Keynesian principles, to pass it over to the next generation.

"It is time to choose between quantity and quality — between accumulating and sharing — between pleasure and joy." ☐

Tom Pickens is a New York-based freelance writer.

Mid-River Barge Corp. To Provide Sub-Sea Contracting Work

Mid-River Barge Corporation, P.O. Box 35, Burnside, La. 70738, has expanded its services to provide sub-sea contracting work, which will be performed in the name of "Sub-Sea Contracting."

The company now has a team of highly experienced professionals in the sub-sea diving business. On the staff are persons with many years of experience in the industry and a vast knowledge of the techniques required to perform qualitative work.

The manager of Sub-Sea Contractors is **D.P. Connally**. In 1958, Mr. **Connally** founded Coastal Diving Company and headed that company until 1968, when he sold it along with his patented sub-sea dry welding habitat. Prior to joining Mid-River, Mr. **Connally** was a ship superintendent for Bethlehem Steel Corporation in Beaumont, Texas, and was involved in the building of Western's Pacesetter I and Pacesetter II, submersible drilling rigs. He also worked in ship repairs, yard maintenance, and rehabilitation of launching ways, docks and bulkheads. Many of the personnel now employed have previously worked with Mr. **Connally**.

Noted Spy Ship Slated For Sea

WASHINGTON (UPI) — Howard Hughes' spy ship Glomar Explorer will go to sea again, the Navy announced yesterday, and this time its undersea mining mission will be public.

The Navy said the ship will engage in a manganese mining venture — the cover story used by the CIA nearly four years ago when it was trying to pluck a sunken Soviet submarine from the ocean bottom and recover secret weapons and codebooks.

The Navy said the government-owned ship would come out of mothballs following negotiation of a three-year lease worth up to $400,000 to Global Marine Development Inc., the company that operated the ship in the 1974 sub-raising operation, code-named Project Jennifer.

An official of Global Marine, Robert Crooke, said the ship will be used later this year for a consortium headed by Lockheed Corp. to explore ways of mining manganese nodules from the seabed southeast of Hawaii.

The CIA used the mining venture as a screen for construction of the ship and its original lease to Global, one of the late millionaire Hughes' companies.

The $550 million Project Jennifer called for Glomar Explorer to haul the 5,500-ton Soviet Golf II-class diesel sub from its 16,000-foot resting place with special clamshell claws.

The CIA said before the sunken vessel could be wrestled aboard a submerged barge, the forward two-thirds of the hull, including its nuclear missiles and sensitive information, broke off and plunged back to the bottom.

The CIA originally planned to go back to the site 750 miles northwest of Hawaii to complete the job. The project was canceled when media reports of the project began surfacing and the Russians became aware of the recovery effort.

Radio Frequency Interference (RFI) from unexpected sources. The ION Radionavigation Committee reports that as power companies become more sophisticated in the use of power line carrier systems, they also are creating interference problems. A survey has shown that such systems are, in some cases, interfering with LORAN C transmissions. The subject of RFI from current carrier systems is before the Interdepartmental Radio Advisory Committee (IRAC).

LORAN A Termination. Because of popular usage and user reluctance to convert to LORAN C, the U.S. LORAN A Chains will not be terminated before mid-1979. Planned termination date for the Pacific chains is now July 1, 1979 and for Atlantic and Gulf chains is now July 1, 1980.

NAVSTAR GPS. NDS-1, Rockwell International's satellite launched on 22 January 1978 is operating above expectations. NTS-2, the Naval Research Laboratory satellite launched last year is no longer transmitting usable navigation information, but is furnishing other useful data. With one satellite and the psuedo-satellites on the desert floor at Yuma, test personnel continue to demonstrate that NAVSTAR GPS will be capable of supporting positioning as forecast to include bomb-dropping within 10 meters.

ADDRESSES OF [illegible] NS

Olsen, Richard
(NEKTON)

RES: 4725 Boxwood Dr.,
San Diego, CA 92117

BUS: General Oceanographics, Suite 25
11578 Sorrento Valley Rd.
San Diego, CA 92121
(714) 452-1792

Rosencrantz, Don
(ex-ASHERAH, RUWS)

RES: 5196 Canterbury Dr.,
San Diego, CA 92116
(714) 563- 3915
BUS: NOSC- Code 5212
San Diego, CA 92152
(714) 225-7629

Staehle, Charles M.
(ex-TRIESTE)

RES: 39 Sierra Lane
Arnold Lane, Md 21012
(301) 757-3050
BUS: NOAA Office of Ocean Engineering-OE3
6010 Executive Blvd,
Rockville, Md 20852
(301) 443-8391

Martin, Bruce
(SDL-1)

RES: 5 Sherbrooke Dr.,
Halifax, Nova Scotia, Canada-
[illegible] B3J-2A0
BUS: Canadian Armed Forces, Fleet Diving
Unit Atlantic, CFB SHEARWATER
Nova Scotia, Canada B3J-2A0
(902)426-5866

McQuown, Michael J., LCdr USN
(NR-1)

RES: 384 Pumpkin Hill Rd.
Ledyard, Conn. 06339
( ) 563-3583
BUS: US Submarine NR-1
FPO New York, NY 09501
( ) 449-3219

Parker, Kevin
(LEO, MERMAID, PC-9)

RES: Middle cottage, Golden Soney Farm
Tackholes, Nr Darwen,Lancashire
England BB3-6N6
0254-77156
BUSL P&O SUBSEA,Seaoil Base, Montrose
Angus, Scotland
0674-2883

Whitfield, Alan M.
(PISCES I-V, VIII, X,
LR-2, TANGO I)

RES: 12 Frankton Ave,,Haywards Heath
W. Sussex, England

BUS: Vickers Oceanics, Led.
Old Docks, Leith
Edinburgh, Scotland.

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

July ~~April,~~ 1978

Vol. XII, No. 3 Published by the Deep Submersible Pilots Assn.

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER should be addressed to:

Robert K. R. Worthington
Editor, DSPA
3005 Curie Street
San Diego, CA 92122 (714) 453- 1158

Correspondence regarding new member applications should be addressed to the Membership Committee Chairman, as follows:

Willis Forman
3940 Sioux Street
San Diego, CA 92117 (714) 273-2967

EDITORIAL NOTES AND COMMENTS

Many thanks to those Members who took the time to write a note on their ballots and especially to those who provided additional news in their letters. It is the first-hand word from Members that provides the greatest interest in this NEWSLETTER. My clippings of information items from periodicals are included just in case you missed them; the news clippings are obviously old, old news but, hopefully, contain some data of interest.

No report has been received to date from Members who attended OTC so, unfortunately, I have no word to pass along. Probably all hands are too busy at this time of year to engage in such activity.

Captain Jack Bennett, USN (Ret), will attend the July San Diego luncheon meeting to tell about AUGUSTE PICCARD, shortly to depart Vancouver for Mobile via many ports-of-call--under her own power! Gulf Maritime, of which Jack is Vice President, is seeking experienced personnel for hire to augment the six-man crew and to serve as relief crew. He is also looking for a man to set up and manage a support facility at Mobile. Jack can be reached at 550 San Mario Drive, Solana Beach, CA 92075, telephone (714) 755-0501. See REPORTS for further information about AUGUSTE PICCARD.

SECRETARY'S REPORTS & NOTICES

Election of Officers--An insufficient number of ballots have been received to date for a valid election. All Members who have not voted are urged to do so as soon as possible. PLEASE!!!

1978 Dues--According to the records, the following have not paid their dues:

Bradley	Helle	Rees	Shumaker
Criger	Johnson	Sanderson	Smith
Donnelly	MacDonald	Saxon	

Please remit promptly and relieve the Secretary and Treasurerof the miserable necessity of further reminders. If your name appears above in error, please advise the Secretary immediately.

Address List--Please check the revised list forwarded with this NEWSLETTER and inorm the Editor of any errors therein. All Members are entreated to advise the Editor or Secretary of changes in this information when ocdurring. Mailings returned for incorrect address are an unfair burden and an unwarranted expense in this day of high postage rates. If you have a preference between use of residence or business address for mailings, advise us.

Jacket Emblems--Kevin Parker forwarded a suggestion for embroided DSPA emblems along with a favorable price quote. It is proposed to proceed with procurement. Thanks, Kevin, and apologies for omitting your name from the list of new Members in the last NEWSLETTER!

European Branch of DSPA--Alan Whitfield has been asked to proceed with his suggested formation of a European Branch if he finds there is sufficient interest.

DSPA Luncheon Meeting at Tarentino's, San Diego 5/2/78

Members present:

W. Forman
D. Rosencrantz
J. Shiller
R. Worthington

Wholesale cancellations at the last minute by expected attendees due to conflicting schedules reduced the assembly to an interesting conversational group.

DSPA Luncheon Meeting at Tarentino's, San Diego 6/9/78

Members present:	Non- Members present
J. Cameron	M. Wills-Lockheed DEEP QUEST
W. Forman	D. McCafferty-Lockheed TRANSQUEST
D. Rosencrantz	
D. Saner	
R. Worthington	

- Approved procurement of embroidered DSPA badges.
- Approved proposal of alan Whitfield to form a European Branch.
- Secretary reported only 12 of 48 Members have returned ballots mailed out seven weeks ago.

- Secretary [illegible] members present of Deep Submersible Safety Meeting [illegible] London in July 1978.
- Secretary [illegible] news from Members as follows:
  Boggs, [illegible], Leach, Parker, Slater, Whitfield.
- July meeting will be held at Mexican Village in Coronado on the Seventh.

REPORTS FROM MEMBERS

Jack Bennett (applicant for Associate Membership) (7/6/78)

"AUGUSTE PICCARD has completed conversion from a 40-passenger, tourist carrying submersible to an offshore survey vehicle with an operating depth of 2300 feet. The work was performed by Horton Maritime Explorations in Vancouver, Canada, over the past several years, and the vessel is now under charter to Gulf Maritime, Inc., of Mobile, Alabama,for work in the Gulf of Mexico. She is now equipped with sub-bottom profilers, side scan, underwater TV, CTFM and collision avoidance sonars, and two underwater telephones. Her ten-ton payload capacity permits installation of a variety of additional devices as desired. Of interest is her recent successful deployment of a TREC while underway submerged. PICCARD is scheduled to transit down the West Coast, through the Panama Canal, and up the Gulf to Mobile during the next few months, with major stops at San Francisco, Los Angeles, and San Diego enroute. She will make the transit on the surface with occasional trim dives, probably with surface escort part way. PICCARD is 93 feet in length and displaces 186 tons. She can charge batteries on the surface, permitting extended operations at sea. As some of the present crew do not wish to deploy to the Gulf, applications for billets in the crew are urgently required from qualified personnel.

Jerry Shiller (7/6/78)

NEKTON GAMMA has been fitted with a hydraulic arm and is being mobilized for departure for operations in Alaskan waters under NOAA contract.

Don Rosencrantz (7/6/78)

"Departing tomorrow from San Diego enroute to Port Said to board R/V MELVILLE for a month of "vacation" observing operations in the Med. He will debark in Cadiz."

J. M. Kishel (6/1/78)

"Not much to report on the CONSTRUCTOR submersible. Things are at a standstill at present."

Rich Slater (5/78)

"I am working for the USGS at Woods Hole this summer. We have 18 days of submersible time , but I don't know which sub yet."

Alan Whitfield (4/28/78)

"I have been seconded [illegible] [illegible]sen Oceanics (Norway) for six months as senior pilot on [illegible] [illegible] is a GRP submersible built by Vickers, with a steel lockout [illegible]. The configuration is similar to the Perry boats. We have just completed acceptance trials in the Norwegian Fiords to 1200 feet; and we start debris recovery work off Ekofisk (North Sea) later this month. About May, we begin lockout training with divers from 3-X. The support ship is M.V. BORGHCLM, fitted with a 1500-foot Saturation Diving Complex.

"As there are now a fairly large number of submersible pilots in the North Sea, there is a feeling that a European Branch of the DSPA might be of value and of interestto both ourselves on the U.K. Continental Shelf and to the rest of the Association in the States. I would be interested to know your own feelings on this subject."

Hal Criger (4/27/78)

"Will get my ballot off tonight as we may leave tomorrow on a diving job. Customer has more tests down hole of the well to conduct with results due early tonight; if unsat, will delay ETD but, to be on the safe side , will mail tonight. Do have some news release to send you but will wait until we return from this trip middle of May.

"Will leave for Brazil on 25 May for one month to dive on wellhead cell cellars installed for Petrobras."

Don Keach (5/2/78)

"We are talking to HYCO and others about the possibility of keeping a small submarine at the Catalina Marine Science Center for use by our marine science people as well as to promote use by the offshore industry. When TAURUS was based there last,a great deal of interest developed in use of submersibles.

"Next week's issue of New West Magazine has a feature article on use of TAURUS to conduct a research project in Psychic Archeology."

Larry Megow (4/27/78)

"How about a blurb about what happened to Bill Rainnie? I heard he was Chief Engineer somplace in Mississippi.

"Sure hope to see some of yawl at O.T.C."

Rick Boggs (5/16/78)

"Having a breather between dives, thought I'd jot a few lines about HYCO Subsea'slatest adventures.

"PISCES VI is now on board the drillship DISCOVERER SEVEN SEAS. We are in position southeast of Valencia, Spain, about 30 miles from the island of Ibiza. Since arriving on location the 3rd of May, we have made five dives to 1160 meters in support of the ship's drilling activities.

"We mobilised [illegible] VI in early January in Pointe Noire, Congo, where we were [illegible], a world record for drilling holes through the water.

"DISCOVERER SEVEN SEAS is a dynamically positioned drillship using six thrusters forlocation keeping and can maintain position one percent of water depth. It's simply amazing to hover next to a sixty-ton blow-out preventer stack suspended by 3800 feet of pipe and watch it move precisely the direction and distance requested when we are setting it on its base on the sea floor.

"I suppose I've become a little blase about the monotonous sea floor below a couple of thousand feet, but coming upon this fantastic machinery with its television lights streaming through the pipes and hoses, illuminating the grey bottom with blue-green light is really incredible.

"AQUARIUS and the HUDSON HANDLER are still very busy in the Gulf of Mexico with a full schedule of oilfield work for the summer.

"PISCES V was on display at OTC in Houston and hopefully will be working soon."

Kevin Parker (5/78)

"I've been waiting for things to happen over here so I could write about them, but apart from the PC-9 incident it's been quiet. PC-9 and her mother-ship SUBSEA TWO are now working in the Irish Sea . MERMAID FOUR is still on STAR PISCES in the Argyle Field and MERMAID III is on SUBSEA ONE which, as you may know, has a bell and 'sat' sustem. LEO is still in the workshops. Something is planned for her but exactly what is not known as yet. We now have a working arrangement of 180 days on, 180 off, which is very easy to work, as most people operational in the North Sea will appreciate ,being attached to one unit for a period of time really cuts down on the amount of luggage being carried to and fro!

"I've given out several application forms around the lads, so you may be getting some soon.

"Enclosed is a quote for DSPA badges from a firm near here. I'm sure that they are cheaper than you can get Stateside. I have no idea what postage would cost. Interested?

"Just for the record, I was made Senior Pilot on April 1."

Don Walsh (4/19/78)

"Don Keach and I were on a 2-month around-the-world lecture trip during January and February............

"Not much to report in the submersible area. Our Catalina Marine Science Center of the IMCS had the new HYCO TAURUS boat undergoing its test program there for 5 months last year, most of the scientific staff at the laboratory got a chance to make some sample dives in TAURUS and this helped spread knowledge in the community about how submersibles can support marine science. Don Keach and I each had "couple of dives and we found the boat to be very well designed for its intended missions.

"TAURUS was the first submersible vehicle to use the Catalina Laboratory as a base. [illegible] engineering complex and marine railway were originally built by North American Rockwell to support the test program of BEAVER. [illegible] these facilities were given to the laboratory. So we're pretty well set up to 'homeport' submersibles. We have complete 'hotel' facilities at the laboratory and deep water (2400 feet) is only a mile or two from the end of the marine railway. Someday, when we get a little larger financial base in the IMCS, we hope to acquire both a submersible and habitat for support of our programs."

Ross Saxon (5/22/78)

UNDERSEA ASSOCIATES INC.
9800 NORTHWEST FREEWAY, SUITE 205
HOUSTON, TEXAS 77092
TEL. (713) 682-0783
TELEX 791034

ROSS SAXON
EXECUTIVE VICE PRESIDENT

"Yet another move; but one which has, in a sense, been planned all along. Who of us doesn't desire to do 'his own thing'? But how many are fortunate enough to get the opportunity?

"I'm sure you are all now aware or the unfortunate death of Jean-Francois Durand and Marc Henry of Intersub. For those who missed CTC, it was 'gloomsville' around the submersible community. He was a good man, a good technicial and engineer, and a visionary regarding making those 'spit kit' submersibles real work tools in the oil industry.

"I'd like to take this opportunity to offer our office facilities here in Houston as a meeting spot for members coming through who need a place to collect thought, write letters, get together, or just relax between appointments.

"Will shortly send you a brochure to bring you up to speed on what Undersea Associates really does."

SUBMERSIBLE SAFETY

INTERNATIONAL SYMPOSIUM to be held on 11, 12 and 13 July 1978 at 1 Birdcage Walk, London SW1

Small submersibles are being used in ever increasing numbers in widely scattered locations throughout the world. As their numbers proliferate it becomes necessary to take a systematic look at submersible safety. Are they designed to be safe, are they, in fact, built to the design and are they being operated safely? The first two points are generally covered by the existing classification society rules. Lloyd's Register of Shipping, The American Bureau of Shipping, Det norske Veritas, and Germanischer Lloyd all have rules or guides for the classification of small submersibles. The Marine Technology Society Undersea Vehicle Safety Standards Committee is currently working on a publication, "Recommended Safety Standards for the Operation of Undersea Vehicles". Developed over the past two years by an international group of submersible designers, builders, operators and safety-oriented agencies, the draft recommendations will form the basis topic of discussion throughout the Symposium.

Symposium participants will be made up of three groups:

A. The working members that have generated the material. Topic presentation will be made by this group.
B. Specifically invited members of industry, government, and the submersible activity field that have a particular interest in submersible safety.
C. Interested members of the public and additional members of submersible-related activities not included in groups one or two due to numbers or contact limitations. Some 100 attendees can be accommodated in this third category, and members or non-members interested in attending are urged to register as early as possible. **The registration fee is £21.60 (including VAT*) *exclusive* of luncheon on 12 July.†**

*VAT Registration Number 242 350495

PROGRAMME

TUESDAY 11 JULY

13.00-14.00 hrs	**SYMPOSIUM REGISTRATION**
14.00-17.00 hrs	**PERSONNEL SAFETY STANDARD GUIDELINE RECOMMENDATIONS** What responsibility do key submersible operating team members have? What authority goes with the responsibility? What qualifications and training should they have to hold a position? *Presentation and Floor Discussion*

WEDNESDAY 12 JULY

09.30-12.30 hrs	**PLANS AND PROCEDURES SAFETY STANDARD GUIDELINE RECOMMENDATIONS** There should be a written operational and emergency plan for each mission involving a submersible. The plan is written before the activity takes place. There should be written operational and emergency procedures that are followed during the actual operation. *Presentation and Floor Discussion*
12.30-14.00 hrs	**LUNCHEON†**
14.00-17.00 hrs	**SUBMERSIBLE EQUIPMENT SAFETY STANDARD GUIDELINE RECOMMENDATIONS** What equipment should be required for a submersible operation to be considered safe? What equipment should be recommended? What equipment should be considered as "nice to have" or optional? *Presentation and Floor Discussion*

THURSDAY 13 JULY

09.30-12.30 hrs	**SELECTED TECHNICAL PAPERS ON SUBMERSIBLE SAFETY** *Presentation and Floor Discussion*

LORAN A. The story in the last News Bulletin was incorrect concerning LORAN A termination dates for the chains used in the civil sector. The dates published for termination are the dates originally established. There is an indication that the Coast Guard may extend some of those dates six months to coincide with the slack season in fishing.

Navy Navigation Satellite System more popularly called TRANSIT has been operating for 13 years. The satellite launched in April 1967 is one of the five satellites operating in the constellation. This and the other operational satellites designed and built by RCA was expected to last for five years.

NAVSTAR GPS. NAVSTAR ONE, the Rockwell-International satellite launched February 22, 1978 is being used effectively in the demonstration and development program. However, it has experienced failure of one of its frequency standards and is losing bits in its computer. Four firms have been selected to perform pre-design studies on NAVSTAR GPS equipment. These studies will serve as the baseline for prototype user equipment.

One Half Fathom

We extend our most profound sympathies to all at Intersub in the loss of 3 of their managers May 5th in an aircraft accident. Those who lost their lives in the crash were Mr. J.F. Durand, General Manager and founder of Intersub; Mr. M. Henry, Technical Manager; and Mr. J.J. Moalic, Financial Manager.

In July fishing biologists from the State of Alaska will join NOAA investigators for a series of submersible dives never before undertaken in support of marine science studies.

The project, named SEA SUB, for Southeast Alaska Submersible, will involve dives down to 1,000' along the rugged Southeast Alaska sea floor in the search for fish, coral, and crabs.

Project SEA SUB investigators, under the leadership of William L. High, a Fishery Biologist with NOAA's Northwest and Alaska Fisheries Center, have identified four major science goals for the project. First, they will acquire information about the topography of the sea floor and the distribution of fish over its rugged surface. Second, they will observe the interaction between fish and crabs and various capturing systems such as traps, hook and line or nets. Third, they will locate, identify and collect species of precious coral. Finally, they will record the natural order of marine animals, on or near the bottom, which are unaffected by man's intrusion. They will then compare this data with similar areas that have been subjected to extensive logging or pollutants.

The expedition will conduct their operations at four different locations. The investigations of the deep rocky bottom areas and coastal fiords will take place near Chichagof Island. The purpose there will be to identify the various species and relative abundance of fish, and associated species, in areas where the bottom is too rough to trawl.

The second area to be covered is in the vicinity of Steamer Bay and Rodman Bay. In Steamer Bay, the group will observe the distribution, abundance and other characteristic of the fish, crab, and shrimp populations in an undisturbed, rocky estuary. These findings will then be compared to the conditions found in Rodman Bay, an area which has been extensively logged.

The behavior and efficiency of sedentary fish gear, such as traps, pots and longlines will be investigated by Project Leader William High at the third location in Frederick Sound.

The fourth part of the project will involve investigations of the Alaskan king crab population with dives being made in Pybus and Gambier Bays. King crab investigations will also take place in Frederick Sound.

The NOAA research vessel JOHN N. COBB, under the Command of Captain Pete Larsen, will set and retrieve fish traps, sunken gill nets, and crab pots for study through the viewing ports of the submersible.

"After a number of delays (always happens after a long complicated overhaul) ALVIN/LULU left Woods Hole last Friday (May 5th) for the southland. This morning they were off of Cape Canaveral and due in Andros Saturday morning the 13th. Will start a series of 12 dives for Navy certification and for our WHOI biologists (we have an established, permanent bottom station just north of New Providence Island in the southeast Providence Channel in 12,000' of water). On the 23rd we'll start northward stopping just south of Cape Hatteras for a series of dives for NOAA on the slope. After a fuel stop in Norfolk on the 6th of June the Group will proceed to the Baltimore Canyon area for another series of dives for NOAA, then home to WHOI on June 17. One long trip from Woods Hole and a 5 day upkeep and the ALVIN/LULU will transit to Ponta Delgado on July 10 for the mid-Atlantic Ridge dives.

Overhaul was rather extensive both for ALVIN and LULU. ALVIN, of course, got her new titanium frame and grew about 2' overall to 25'. Got a little heavier too. LULU was completely renovated inside and out with all new wiring and piping and many habitability improvements. The submarine cradle system was completely overhauled with many new components. New engines and drive units have increased LULU's speed by a couple of knots. Much better ship now.

A very lovely cover was received from the AUGUSTE PICCARD this month for a dive on 6-7-78 for ABS/MOT Certification. The dive went down to 2300' at Jervis Inlet, B.C. with Capt. Tom Sawyer at the controls. Capt. Sawyer wrote a very nice note to give the details of the dive. It looked like a xerox copy and I believe that copies were probably included in the covers serviced. However, I will reprint here for the benefit of the other pilots who would not have received a cover.

"The purpose of this dive was to certify the submarine to operate up to a depth of 2100' and to do this the submarine must go to a depth 1.1 above the desired working depth. The AUGUSTE PICCARD left Vancouver, British Columbia, at noon on June 5, and propelled to Jervis Inlet. On arrival the submarine was "opened up" for diving and taken to 100' where we obtained a "stop trim", (neutral buoyancy). On achieving this we trimmed aft to forward to give ourselves a 15 degree bow down angle and then pumped in 400 kg of water for the desired negative buoyancy. On completion we surfaced, secured to a drop line on a barge, and compensated for the crew's weight by adding 500 lbs. of slab lead in the control room. When ready, the main vents were opened by a remotely controlled timer and the submarine held at 30' until checked out by divers. AUGUSTE PICCARD was then lowered at 50' per minute to a depth of 2300' and held at that depth for two minutes. The in haul rate was the same and on arriving at the surface, divers injected air into the number's four and five main ballast tanks raising the after hatch above water to enable entry of the engineer and captain. The submarine's ballast tanks were then blown for full buoyancy, and an inspection done. On completion we slipped the drop line and propelled to Vancouver. A total of 50 covers were carried on this dive, the deepest AUGUSTE PICCARD will ever go."

I had a very nice letter from Mr. Sven Rahmberg at Kockums shipyard regarding the schedule for the URF. It was written on 4-17-78 and at that time the vehicle was undergoing the final inspection and was due for launching sometime that week. In May the URF goes to Kiel for testing in the pressure testing dock and then out to sea for real sea trials.

Our good friends on the JOHNSON SEA LINK subs never forget us. They continue to document their important and historical events for us. The latest addition is a cover for dive #327 on 3-16-78 at Grand Bahama Island for a "dry transfer" to "develope cosmic plates". This dive went down 1003' with Tim Askew as pilot.

"At 3:15 p.m., Thursday, March 16, 1978 a thousand feet beneath the blue Bahamian waters, the hatch of a Harbor Branch JOHNSON SEA LINK submersible (JSL 2) opened to a large receiving chamber already placed on the sea floor in October, 1977. Man's first photographs of cosmic ray tracks from the deep ocean were transferred into the diver's compartment of JOHNSON SEA LINK where they were developed to make visible the latent images of these rays. This transfer and data acquisition marked a major milestone in man's quest to understand his destiny and the origin of the universe.

The aluminum receiving chamber was designed and constructed by Harbor Branch Foundation engineers. Last October photographic emulsions, used to record the cosmic ray tracks, were prepared within the submersible and transferred to the underwater chamber by Harbor Branch diver crews and the participating scientists. The present mission recovered the first of two such experimental packages; the second will be recovered in October, 1978 -- one year after its deployment.

The mission scientists are now anxiously awaiting the results of a computer scan of cosmic ray tracks made in the developed photographic emulsion plates of the first package recovered by JOHNSON SEA LINK. The scientific project is called MUON (named for one of the cosmic particles).

The principal aims of the project are to study the nature, energy spectra and abundance of these extraordinary cosmic rays."

Jul 79

In the April issue on page 25 I wrote about the P&O submersible, PC 9, which got trapped and was subsequently rescued by another sub. This month I have more info about the rescue from Mlle. Yvette Siniscalchi of Intersub, and also the MTS newsletter. Also, I was really delighted to get a cover from the PC 9 for the dive on which the rescue took place. This was for dive #25/78 on 3-9-78, depth 360', location wellhead 3/29/1, pilot J.E. Jones and co-pilot W. Cornwall. We also have a promise from Yvette for a cover from the Intersub PC 1202 which made the rescue.

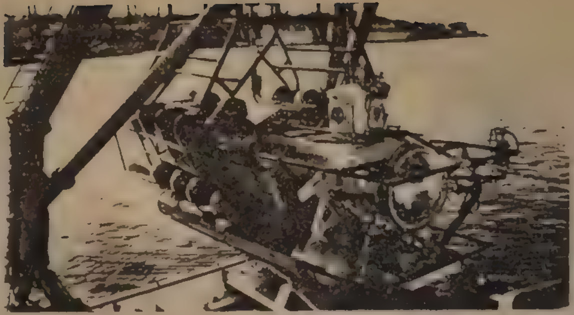
Here is Yvette's account of the happenings. "On Thursday March 9th, at 12:00, P&O's sub, PC 9, was working on a field in the North Sea, for debris clearance, when the pilot noticed that some old ropes were wrapped around the propeller immobilizing the sub on the bottom. At 06:00 PM INTERSUB THREE, with 2 subs on board, left her work on a nearby area and went to the rescue. She arrived on the site at 04:00 AM. A Norwegian ship, SEAWAY EAGLE, was already trying to rescue the PC 9 with a diving bell, but with no success, because the diving bell was not mobile enough. SEAWAY EAGLE yielded to INTERSUB THREE and our sub PC 1202 (lock-out) was launched with 3 men and 2 divers on board. PC 9 was rapidly located, PC 1202 stopped near the vehicle and tried to cut the ropes with a cutter mounted on its manipulator arm. But with no success. Then the divers were placed in saturation and at 7:00AM they went out and delivered the sub without any difficulty. Both subs were recovered at 8:30 AM."

Submersible rescue in North Sea

A submersible owned by P&O Subsea with two men inside became entangled in a steel cable near a wellhead on the floor of the North Sea in 355-ft water. Nearly 24 hours later, Jamie Jones, 31, and Bill Cornwell, 26, broke the surface under the submersible's own power after a diver-lockout submersible owned by InterSub, a competing company, came to the rescue.

The two men were diving in a *PC-9* in an area about 70 miles east of Lerwick. The dive began at 8 a.m., March 9. The submersible's propeller became entangled in a steel cable and the two men immediately shut off all but emergency lights and sat back to wait.

InterSub sent its support ship *InterSub Three* to the site with a *PC-1202* diver lock-out submersible. At 5:15 a.m., March 10, the InterSub vessel dived with a three-man crew and two divers. After studying the situation, a diver was locked out of the submersible at 7:50 a.m. and freed the *PC-9*. The diver was back in the *PC-1202* at 8:10 a.m. and the vessel was recovered on its support ship at 9:05 a.m.


PC-1202 *came to the rescue.*

At 9:40 a.m., the *PC-9's* mothership recovered the unit. The crew was fit and well. They were taken to a nearby platform where they were loaded on a helicopter for a flight to Aberdeen and their families.

JUL 78

MTS on the Spot

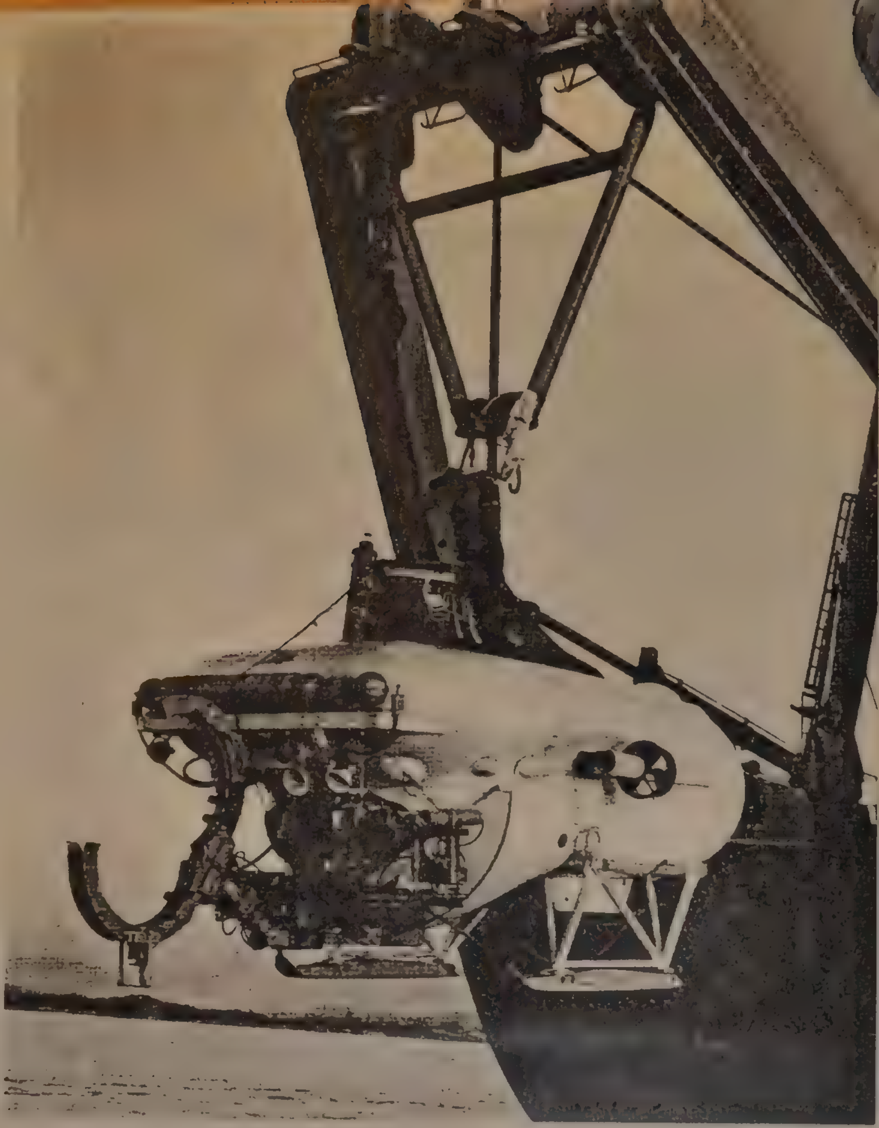
The Marine Technology Society was represented at the 1978 Oceanology International Conference in Brighton, England, by John Pritzlaff, Chairman of the Undersea Vehicle Committee Safety Standards Subcommittee. Mr. Pritzlaff's paper, "Submersible Safety Through Use of Recommended Safety Standards" was scheduled for Friday, 10 March as part of "The Use of Submersibles in the Offshore Industries" session. As chance would have it, on Thursday, 9 March, the P&O subsea submersible PC-9 became entangled in lines around a wellhead she was working on and was trapped underwater. She was 325 feet down, some 70 miles east of the Shetland Islands.

Word of the incident reached the conference in Brighton during the afternoon and there was much speculation as to the type of rescue that would be used. As is standard practice, the three nearest ships having rescue capabilities were alerted and asked for assistance: The *SeaWay Eagle* with a saturation diving rig arrived at 22:00. The *Intersub 3* with two submersibles on board (PC 1201 and PC 1202) arrived at 03:15 on the 10th and *Sub Sea 1* with *Mermaid III* arrived at 08:00.

The actual rescue was carried out by the Intersub lockout submersible PC 1202. The dive was initiated shortly after 08:00, and by about 10:00, a single diver had locked out and cut the one inch polypropylene line and freed the PC-9. Time below had been 24 hours. In this case, the danger was not extreme as the PC-9 carried air, food and water for 7 days.

Pipeline Covering To Be Tested

Tests will be carried out this summer in the Trondheim fjord offshore Norway on a new concrete cover for underwater pipelines. The method calls for manufacturing concrete aboard a vessel and laying it on subsea pipelines. Concrete would leave the ship over the bow before it solidifies and would be directed to the pipeline on the seafloor by a small submarine. The method could be more economical than burying pipe by conventional means.



SHAPED CHARGE CUTTER for rough cutting of underwater pipe line extends from the bow of the P8 submersible.

Preparing pipe lines with a submersible

Vickers Offshore recently demonstrated the ability of a submersible and its support vessel to deploy and locate six tons of equipment onto a pipe line in 1,000-ft water depths. The achievement nearly completes the demonstration of the submersible operated pipe line preparation system.

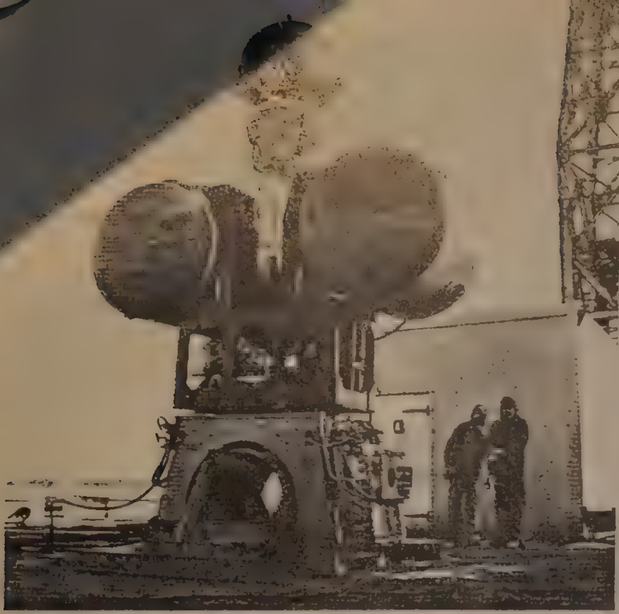
Although the latest test was curtailed because of high currents, the system is considered a success. *Ocean Industry* will publish the final results of these tests when they are completed later this summer in deep Scottish waters.

Three tests have been completed to date. These were conducted in July and November of 1977 and February of 1978. The first offshore demonstration took place in the Norwegian trench with the excavation of a buried pipe line with a submersible mounted tool. All operating techniques and support equipment were standard.

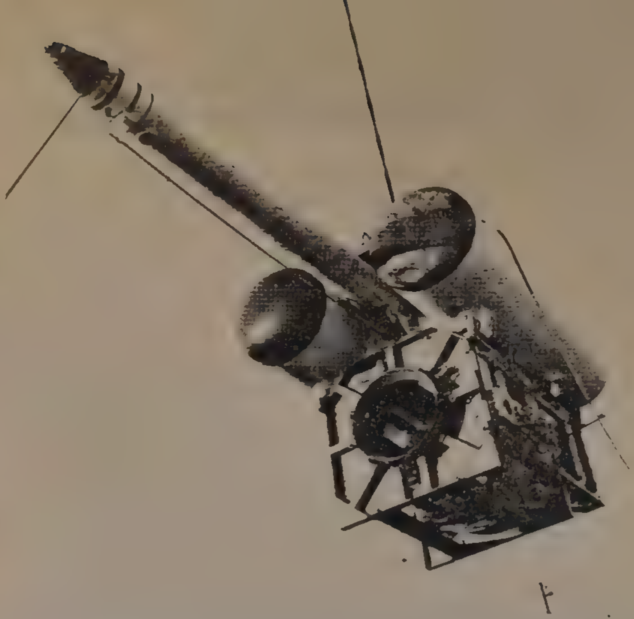
In the November test, Vickers Vanguard and submersible P8 operated in Kloster Fjord to set hydraulic and explosive devices onto a 36-in. diameter sample pipe line of 1-in. wall thickness.

The tools enable the submersible to slit and explosively remove reinforced concrete weight coating, remove glass fiber-reinforced corrosion coating and explosively sever the pipe line. All the tools have been successfully demonstrated in water depths in excess of 1,000 ft.

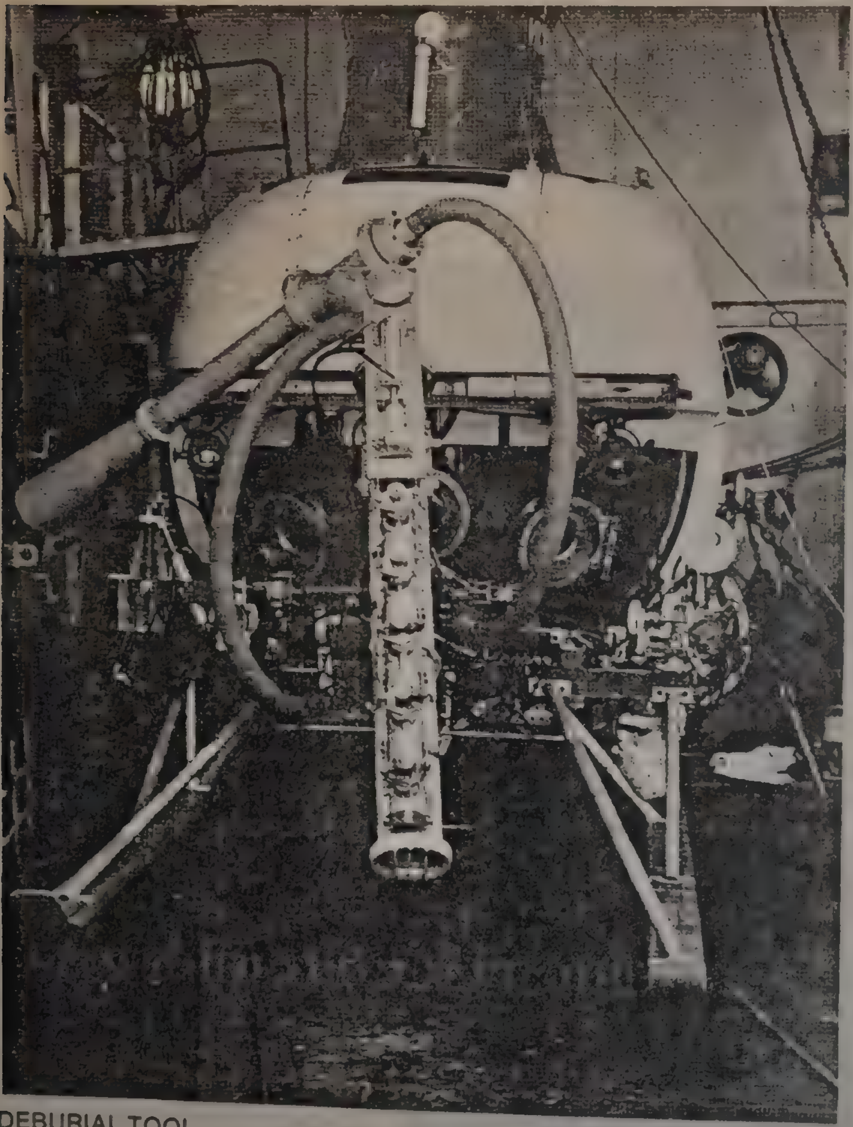
In the February demonstration, the machine tool was transported by a buoyant carrier which was



HAUL DOWN UNIT and pipe clamp.



EQUIPMENT CARRIER with the weld bead removal and final cut machines.



DEBURIAL TOOL.

launched and recovered using conventional submersible handling techniques.

How they do it. The carrier is hauled down to the seabed and captured by the pipe clamp previously positioned on the pipe line by the submersible. The hauldown, subsequent location of the machine tool onto the pipe and the machining operation are controlled and powered by the submersible on the seabed.

Hydraulic and electrical power and electrical control signals are transmitted to and from the submersible by make and break connectors. Hook up of the transmission lines is accomplished using the submersible's manipulator

The weld bead remover semi-automatically locates the bead and sets the appropriate depth of cut out of the operator's field of vision. The tool also contains the parting off machine for severing and squaring off the explosively cut pipe end.

The tooling and hardware is designed to use the free swimming, surface independent elements of manned submersible operation and to operate from a standard submersible support vessel. The system is depth insensitive—the only pressure resistant elements are the pressure vessels providing buoyancy.

The program is funded by Statoil on behalf of the Statoil-Mobil Group as part of the Statfjord Transportation System project. ✔

-14-

Circle 86 on Reader Service Card →

Geophysics from a submarine

Currently engaged in offshore su [illegible] of Georgia between mainland Cana [illegible] couver Island is a rebuilt, highly instru [illegible] marine. Horton Maritime Explorations' submersible *Auguste Piccard*—93-ft (28.3-m) long and displacing 168 tons—is performing a combination of commercial exploration work and ongoing geophysical system tests. She is an all-weather craft which can acquire geophysical and oceanographic data over extended periods of time and under a variety of operating conditions at depths to 2,300 ft (701 m).

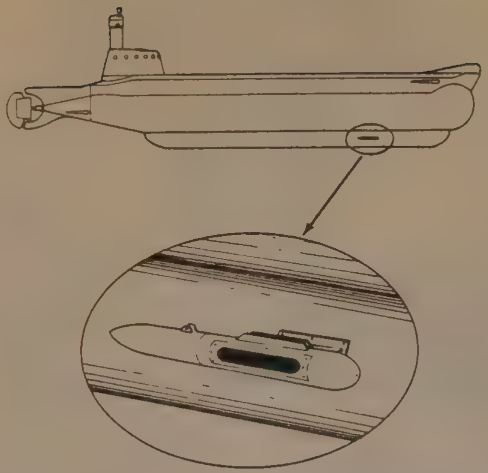
The craft can accommodate a nominal crew of six with up to three observers for a period of two weeks without substantial surface support other than that required for routine communications purposes and provisioning. The craft can be towed at speeds up to 8 knots for long relocations. For greater distances or speeds, deck loading is used. Fuel for 1,000 miles (1,609 km) of surface operation is carried. Navigation requirements are met, in part, by Mesotech System's acoustic equipment.

The present workload also includes a geophysical survey for the British Columbia Hydro and Power Authority for the location of underwater pipe lines and electrical cables. Under development is a general seafloor engineering package which will allow for coring, shear-vane and penetrometer measurements and other sampling and testing devices. Prototype coring in early 1978 is achieving 3 to 4-in. (7.6 to 10-cm) diameter cores about 10-ft (3-m) long. Once the prototype is proved, bottom core lengths of up to 330 ft (100 m) in length will be considered.

Present experience would indicate that Horton's sub-bottom profiling system offers a great deal of operational flexibility and apparently greater penetration and higher resolution of sub-bottom features than equivalent surface-towed systems.

A side-scan sonar system, designed and fabricated by the Environmental Products Group of EG&G, is mounted on the side of the submersible. The system includes a standard Model 259-3 Graphic Recorder and two standard Model 272 Side Scan housings—one on each side. The housings hold only one transducer each instead of the customary two found in towed fish. EG&G supplied the electronic components, wiring and special mounting brackets.

UNMANNED SUBMERSIBLE OPERATED FROM DECK OF MANNED SUBMERSIBLE. *TREC,* a remotely controlled unmanned submersible built by International Submarine Engineering, was recently deployed from the deck of the *Auguste Piccard,* a manned submersible operated by Horton Maritime Explorations. The sea trials of the *TREC* showed the system was feasible for subsea operations when surface weather conditions would halt use of a tethered vehicle from a surface ship. The unmanned submersible is being used by Horton Maritime for a pipe line and cable route survey for British Columbia Hydro in the Strait of Georgia.



SIDE-SCAN SONAR is attached to the submersible's hull.

Unmanned Depth Record Set

During acceptance trials off Bermuda on February 9, the SCARAB undersea vehicle operated at a depth of 1835 meters (6020 feet), setting a deep diving record for a commercial unmanned vehicle.

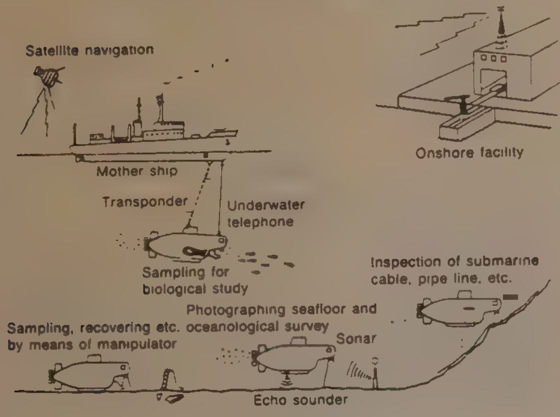
Designed and developed by Ametek, Straza Division, El Cajon, Cal., the SCARAB (Submersible Craft Assisting Repair and Burial) system can inspect and raise underwater communications cables. After repair work, SCARAB relays and reburies the cables.

Built for Transpacific Communications, Inc., Bedminster, N.J. (a subsidiary of American Telephone and Telegraph Company), the system will be stationed in Bermuda for Atlantic and Caribbean cable repair operations.

Submersible with 2,000-m depth capability. The Science and Technology Agency started construction of a 2,000-m deep-diving research submersible in 1977 by awarding the contract to Mitsubishi Heavy Industries (MHI). The mother ship to transport it to the operation site will be built by Kawasaki Heavy Industries.

This submersible was designed for detailed survey of the deep seabeds with respect to geographical distribution of biological and mineral resources, seabed topography and other oceanological objects to be studied which have not been observed by other conventional means.

The construction will be completed in early 1981 after various technical and operational tests at sea are conducted. The submersible will be operated by the Maritime Safety Board (Japanese Coast Guard). The agency has long experience in research submersible operation. Fig. 4 gives an idea of how the submersible


Satellite navigation
Onshore facility
Mother ship
Transponder
Underwater telephone
Sampling for biological study
Inspection of submarine cable, pipe line, etc.
Photographing seafloor and oceanological survey
Sampling, recovering etc. by means of manipulator
Sonar
Echo sounder

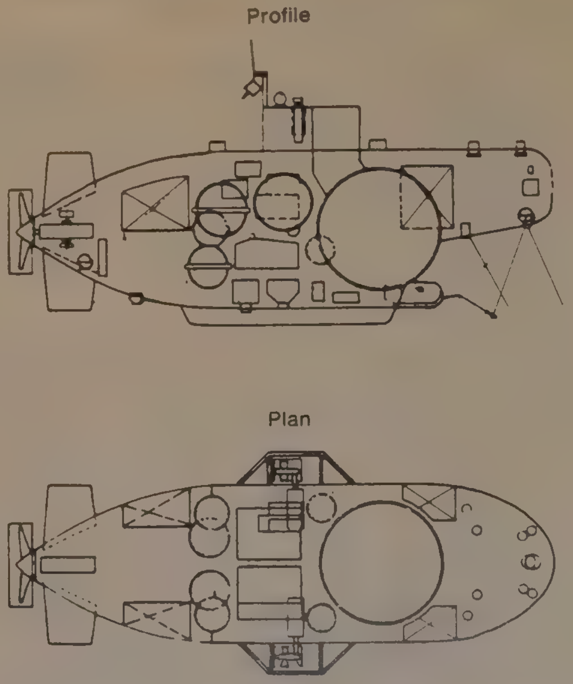
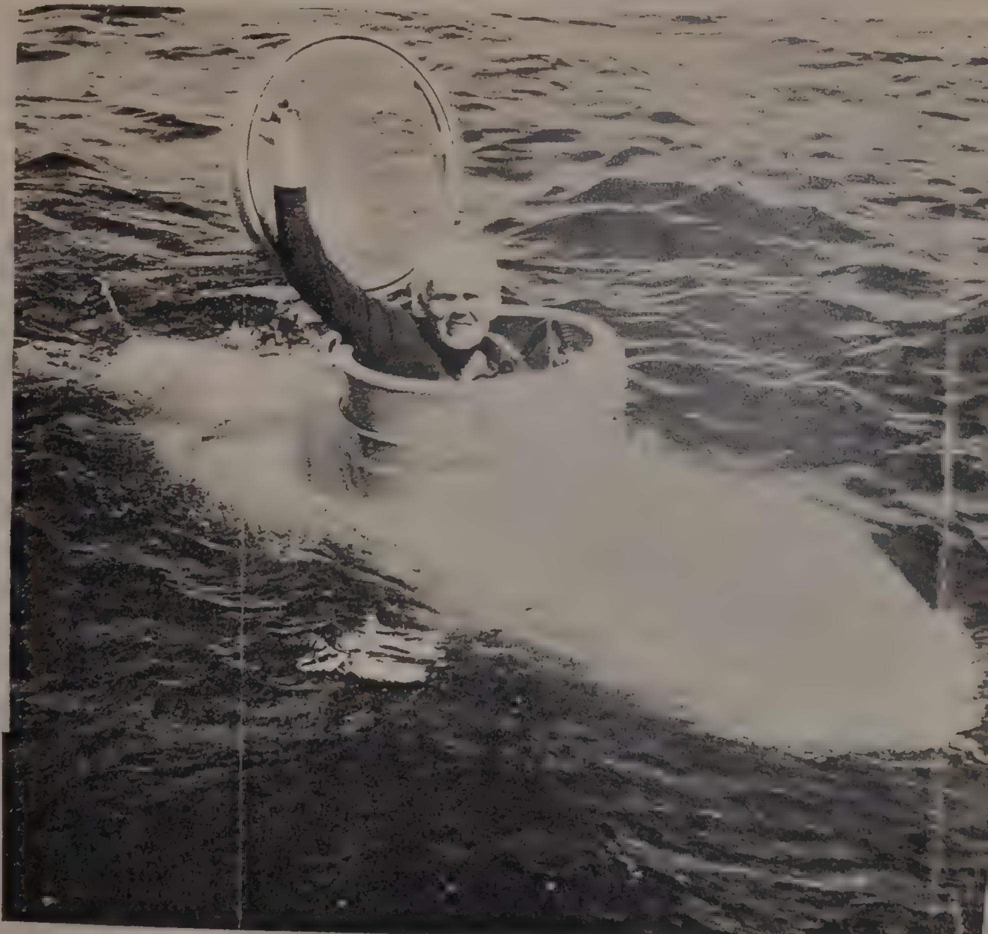

Profile
Plan

FIG. 5—Details of deep-diving research submersible.

New Diving Support Vessel Begins North Sea Operations

The MV *Talisman*, one of the most sophisticated multi-purpose underwater construction and engineering diving support vessels built for offshore operations, is engaged in a wide range of diving services in the North Sea. Operated by Comex Diving, based in Marseilles, France, the vessel is working on the tie-ins of the Statford oil field's Condeep platform in the North Sea. The vessel will then work on underwater connections in the Dutch Sector.

The vessel's diving equipment is capable of supporting saturation dives to 1,000 ft. with 20-hours-a-day bottom time. In addition, it will provide this year a hyperbaric welding system, a submarine for work including inspection and observation and various other diving related functions. *Talisman* has accommodations for a crew of 80 and is equipped with a deck crane, helideck and a fully equipped workshop for fast on-site maintenance.



AHOY! One-man submarine for exploration, ▶ salvage work or shellfish hunting has a speed of 2½ knots and operating depth of 250 ft. An acrylic conning tower hatch and bottom port permit viewing. Built by Kittredge Industries, Inc., U.S. Route 1, Warren, ME 04864, the K-250 is 10'6" long, 3' in dia. and weighs 2,200 lbs.

Crane on submersible deck adds new work dimension

With a 10-ton hydraulic crane on the deck, the Hydrospace Service Vehicle (HSV-1) can transport loads to the seabed for on-site positioning. With proper buoyancy, heavier loads can be handled.

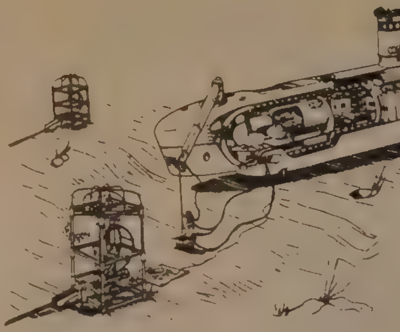
The *HSV-1* can transport and maintain a team of six divers to depths of 1,000 ft for bottom times of 72 hours. This system, which incorporates the characteristics of surface vehicles, submarines and saturation diving systems has been developed by Hydrospace Systems Inc.

The *HSV-1* helps divers working on subsea systems year-round during adverse weather conditions. It also provides an integrated system of tools, power, life support sanctuary and transport vehicle.

The *HSV-1* moves to and from operating base, hull-down, to minimize adverse weather and sea conditions. Upon arrival offshore, it submerges and proceeds to the subsea work site. The twin main propulsion system plus the forward and aft transverse and vertical thrusters allow precise positioning in the water column and on the seafloor.

A complete mixed-gas 6-man saturation diving and power system will support teams of either one or two divers plus a standby diver, working in shifts.

Diver compression and decompression can take place onboard the *HSV-1* without shore-side or support-vessel assistance, or the divers can be taken ashore by transfer bell for shore decompression at the end of the mission.



Characteristics of the *HSV-1*:

Normal mission time without resupply	10 to 15 days
Surface battery charging period between bottom times	12 to 15 hours
Surface speed	8 to 9 knots
Surface range, maximum	2,000 miles
normal	1,500 miles
Size, length × beam × hull depth	115 × 23 × 26 ft
Surface power, diesel	680 hp
Submerged positioning power, electrical (lead acid batteries)	640 hp
Submerged cargo payload (plus crew, fuel and expendables)	10 tons

From the paper "The Development of Specifications and Preliminary Design of Hydrospace Service Vehicle (HSV-1)" presented by John Ritter, president, and Raymond Peabody, development engineer, Hydrospace Systems, Inc., at the International Diving Symposium '78, Jan. 30 to Feb. 1, 1978, New Orleans, La.

The Titanic Again

Over many years there were repeated attempts to locate the Civil War ironclad *Monitor* off Cape Hatteras. The results were more fiction than fact. Only with a major search using the major technologies of side scan sonar, profiling sonar, magnetometers, photography and closed circuit television was the discovery made in 1973 and later explored. (ST April, 1974, page 24; June, 1974, page 15; Sept., 1977, page 19.)

A similar situation has surrounded the *SS Titanic*, the British White Star liner, 46,328 gross tons and 882.5 feet long, which, on her maiden voyage, struck an iceberg on the night of April 14-15, 1912, and sank in approximately 12,000 feet of water 1,600 miles northeast of New York City. The not-for-certain coordinates are 41°46′ N. Lat.; 50°14′ W. Long. The sinking has been portrayed in stories and motion pictures, and searches have been conducted.

Now there is another expedition based on hard technology being planned. It is to be backed by a magazine, the Navy, and a research institution. A well known marine geologist is a key planner. The aim is to locate the ship, then explore it with a submersible, photographing it thoroughly. By the time this is read the news of the expedition may have been published.

Submersibles Guide Published

Submersibles employed in offshore research and engineering are described in a recently published guide. *Submersibles and Their Use in Oceanography and Ocean Engineering*, edited by Dr. Richard Geyer of Texas A&M University, includes case studies covering a wide range of applications.

Submersible roles (both present and future) are analyzed and merits of manned versus unmanned submersibles are discussed. An appendix provides detailed information on capabilities, construction and instrumentation of more than 100 submersibles. Copies of the reference work, the first of its kind, are available for $52.25 from Elsevier North-Holland Inc., 52 Vanderbilt Ave., New York, NY 10017.

Offshore, Diving, Submersible Register Published By Lloyds

Lloyds Register of Shipping recently released a new 212-page offshore register containing information on several hundred offshore units, submersibles and diving systems.

The Register contains exhaustive detailed information on more than 400 offshore units, more than 200 submersibles and all diving systems classed by Lloyds.

Available for £10 it is considered by *Sea Technology* to be a higly credible document and valuable reference material.

Ocean Minerals Company refurbishing Glomar Explorer

SAN FRANCISCO — The largest and most sophisticated mining ship in the world, the Glomar Explorer, is coming out of mothballs and has begun refurbishment here in preparation for ocean mining tests later this year for Ocean Minerals Co. (OMCO), a company in which LMSC is a shareholder.

Mining tests will begin next November to evaluate the performance of a bottom miner developed by OMCO to pick up mineral-rich nodules from the ocean floor. The nodules contain manganese, nickel, copper, and cobalt and are found in 14,000-18,000 feet of water in almost all oceans of the world.

According to Conrad Welling, OMCO vice president-programs, the Explorer will be operating in the mid-Pacific between the Hawaiian Islands and Baja California where the richest nodule fields are located.

"At the start of the tests," Welling said, "the miner will be lowered more than three miles to the ocean floor from the ship's huge 200' x 74' floodable well. Thirty-foot sections of pipe will connect the miner and the ship, and lowering operations are expected to take a few days.

"After the miner is on the bottom it will sweep a pre-charted mining site to collect nodules and bring them through the pipe to the surface."

A key feature of the Explorer is the stabilization system which allows the derrick and mechanisms which hold the pipe to remain almost motionless as the ship pitches, rolls, and heaves on ocean swells.

Welling added, "While the miner is working on the bottom, the Explorer's navigation and computer system will keep the ship and the miner tracking the same course with high accuracy.

"The ship's computer system accomplishes this through the use of sonar transponders placed on the ocean floor, and thrusters located on the bow and stern of the ship. As signals are received from the transponders, the computer figures the deviation from the planned course and instructs the thrusters to respond accordingly to maintain the correct heading."

OMCO is a partnership formed in November 1977 by Ocean Minerals Inc. and by Amoco Ocean Minerals Co., a subsidiary of Amoco Minerals Co., Chicago, which in turn is a subsidiary of Standard Oil Co. (Indiana). Shareholders in Ocean Minerals Inc. are: Billiton B. V., a member of the Royal Dutch/Shell Group; BKW Ocean Minerals B. V., a subsidiary of Royal Bos Kalis Westminster Group N. V.; and LMSC.

Globule III is New Comex Industries Sub

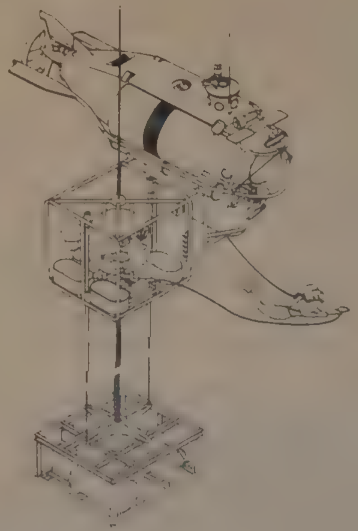
Comex Industries, Marseille, France has designed and built a new two-man observation and work submersible capable of work to 1,000 feet for as long as four hours. Called *Globule III*, the sub has a spherical hull which permits pilot and observer to sit in comfortable upright positions.

Six thrusters make the sub highly maneuverable at speeds up to 2 knots, even in tight operating areas, as around platform structures. In the tethered mode its endurance is considerably longer than four hours, affected principally by the endurance of the crew.

Optional equipment includes a manipulator and tools for sawing, wirebrushing, jetting and cable cutting.

Subsea work module holds diver's tools

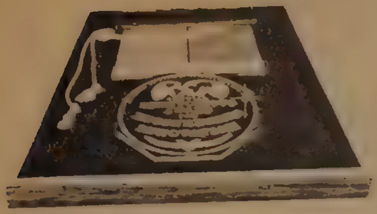
A logistic module developed by Centre d'Etudes et de Recherches Techniques Sous-Marine provides divers with a subsea work base for storage of tools and equipment. Working from the module, the diver would not be required to return to the diving bell or submersible to get new tools.



The module has a maximum depth capability of 600 m. It has two major parts. The base normally rests on the seabed and houses heavy equipment such as transformers, hydraulic generator, gas cylinders, pumps, etc. The upper part of the module has positive buoyancy. This allows this part to be positioned near the work to be done. The buoyant part carries a full set of tools for the diver as well as a frame which can serve as a resting place for a diver-lockout submersible.

A control board on the ship allows the work to be monitored at the surface. The module weighs five tons in air and is 2.8 × 2.5 × 3.6 m. Hydraulic, electrical and pyrotechnical tools can be operated from the base. Pneumatic tools and oxygen cutting torches can also work from the base.

Engineering Innovations



Five firms were presented with the 1978 OCEAN RESOURCES ENGINEERING special meritorious award for engineering innovation.

The firms were: Comex Services/Comex Marine Service, Inc., Decca Survey Systems, Inc., Perry Oceanographics, Inc., SAAB-SCANIA Areospace Division, Wharton Engineers (Elstree) Ltd.

Each received awards from Energy Publications, the Dallas-based division of Harcourt Brace Jovanovich which publishes Ocean Resources Engineering, Petroleum Engineer International and Pipeline & Gas Journal.

Presentations were made at the Offshore Technology Conference in Houston. This marks the fourth time Energy Publications has bestowed the awards to creators of innovative technology.

The awards are based on three criteria: (1) The product must demonstrate innovation in design, concept and application; (2) must help solve a problem; (3) must have potential for improving operating efficiency and profitability.

Decca Survey Systems, Inc. of Houston was recognized for its Decca Autocarta, a real-time data acquisition and charting system consisting of a mini-computer, an x-y plotter, a keyboard/printer with dual cassette tapes, special interface circuits and a left-right indicator. The system is used in seismic and hydrographic work, in dredging and other offshore applications.

Wharton Engineers Ltd. of Elstree, England was awarded for its Wharton Quadruple Capstan Winch, which is smaller than conventional winches and works with reduced torque input. The winch is designed for tensioning wire rope for mooring semi-submersibles and other offshore vessels and to use in cranes, derricks, drawworks, hoists and tensioners.

The SAAB-SCANIA Aerospace Division of SAAB, Linkoping, Sweden, was recognized for remote controlled subsea vehicle system. The unmanned, television-equipped system can perform underwater jobs, such as inspection of cables, structures and pipelines, measurement and recording, seabed sampling and investigation, rescue and salvage operations and other tasks.

A manned subsea vehicle, the PC1803 Diver-Lockout Submersible, won the award for **Perry Oceanographics, Inc.,** of Riviera Beach, Fla. The submarine has a forward compartment for a pilot and observer and a diver-lockout to accommodate two divers. Equipped with color TV, the vessel is used for pipeline route surveys, all kinds of maintenance, and other applications.

Another subsea vehicle, Comex Manipulator Observation Bell, won the award for **Comex Marine Service Co.** of Paris, France. The vehicle can take a crew of 2 down to 3300 ft to provide drilling assistance in deep waters. The bell can be launched through the moonpool or over the side of a vessel. It has been used for direct observation and television transmission of subsea operations, change pingers, setting explosive devices, turning valves, hydraulically activating BOP stack connectors and other subsea tasks.

Submersible has low-light TV "eyes"

The *SMT-1* underwater vehicle, operated by Sonarmarine, has been fitted with a complete battery of visual inspection systems supplied by Marine Unit Technology Ltd. The vehicle carries a low-light silicon intensified target camera as well as a vidicon camera. The closed circuit TV systems act as part of the vehicle's underwater navigation system when following a pipe line and as a separate inspection tool for complete visual survey.

National Center for Underwater Excellence*. The federal government and the government of the Province of Newfoundland are discussing the establishment of a National Center for Underwater Excellence in St. John's with three major spheres of activity. These are: 1) training of pilots for manned and unmanned submersibles; of service technicians and other operational personnel for all underwater systems; of subsea inspectors and rig medics, and of commercial air and mixed-gas divers; 2) laboratory and locational testing of subsea hardware and personnel in cold, ice-covered, deepwater, and 3) research and development capabilities for contract and subcontract work, hopefully without direct competition with private industry.

One-man sub for 2,000-ft depths

Oceaneering Int'l. Inc. will demonstrate its latest one-man submersible, *WASP*, at the show. The one-atmosphere vehicle has Oceaneering's patented articulating arms and manipulators, and a trunk containing foot controls for the four thrusters which give the unit full freedom of horizontal movement and the ability to ascend or descend. It is operational to 2,000 ft. The unit is produced by O.S.E.L. of the UK. Oceaneering has exclusive rights to market the vehicle.

Sea Study Treaty Criticized

GENEVA, Switzerland (UPI) — A leading U.S. oceanographer yesterday accused developing countries at the U.N. Law of the Sea Conference of making marine research "almost impossible."

William A. Nierenberg, director of Scripps Institution of Oceanography at UCSD, criticized the language of a treaty on marine research that, he said, "inhibits any possible effect science might have on the ocean for the benefit of mankind."

Nierenberg said that by claiming a 200-mile exclusive economic zone off shore, developing countries "are making it more and more difficult, if not impossible, to do the sort of research that will lead to a better understanding of the ocean."

Nierenberg, said the developing countries have put "an exaggerated emphasis" on the more tangible values of the seas — minerals, oil and fish — while ignoring the importance of the study of the marine environment, conservation of fish and short term weather predictions.

Nierenberg also charged Western nations with being "absolutely supine" and having a treaty "rammed down their throats by developing countries."

U.S. To Attend Talks On Sea Cooperation

By L. EDGAR PRINA
Copley News Service

WASHINGTON — The United States has decided the United Nations Conference on the Law of the Sea made sufficient progress at the recent meeting in Geneva to work for a treaty of cooperation on the oceans.

This was the report made Monday by Elliot L. Richardson, President Carter's special representative to the conference, at a news conference at the State Department.

Before he left for the Swiss city last March, Richardson was pessimistic, saying, "It is more true than ever before Monday, that this conference is a make-or-break session."

However, he reported achievements in working for compromises on a number of problems and announced that the United States would attend when the seventh session of the conference resumes in New York City for a four-week period beginning Aug. 21.

The conference has been split between the Third World developing nations and the industralized countries, making it difficult to reach compromises on a number of issues.

Richardson said one of the signs of progress was that there was none of "the public posturing" characteristic of the earlier sessions on deep seabed mining.

He noted that there were still "misconceptions of the value of seabed minerals" and the cost of exploiting them that had to be dispelled. These misconceptions are held by many of the developing countries.

"Transfer of technology is no longer a precondition of obtaining a contract to mine," Richardson said.

But perhaps the most noteworthy achievement of the Geneva session, according to Richardson, was the negotiation of the right of landlocked and geographically disadvantaged states to fishing rights within the 200-mile zone of maritime countries.

He also reported progress on the most divisive issue at the conference: establishing an international authority to regulate deep seabed mining and distribute a share of the profits to the international community.

Largely through the efforts of the United States, France and Canada, the proposed treaty texts on the maritime pollution problem were improved, Richardson said.

Law Of Sea Talks Fail Once Again

GENEVA, Switzerland (AP) — The seventh session of the U.N. sea law conference adjourned late last night after failing to agree on a treaty. It scheduled another meeting for Aug. 21 in New York.

The five-year-old negotiations began in New York in 1973 and have alternated among New York, Caracas and Geneva. The purpose is to work out a universal sea law convention on sharing the oceans' living and mineral resources.

The 142 governments represented in the eight-week Geneva meeting could not agree on one single article of a convention and remained split on virtually every aspect of how to divide the seas' rich potential of fish, oil and minerals among themselves.

ARGUE OVER DATE

On the final day, the conference debated for five hours proposals by African and Arab states to meet again in New York in August and Latin American requests not to resume before next year.

The first plan won 51 to 46 in a secret ballot, with 12 abstentions and one invalid ballot. Thirty-two delegations already had left the conference by the time the vote was held.

Conference President Hamilton Shirley Amerasinghe, former U.N. ambassador of Sri lanka, told a brief news conference: "You can imagine how difficult it is to agree on matters of substance when you cannot even agree on when you should meet."

CONSTANT WRANGLE

The first two weeks of the adjourned session were taken up in a wrangle between the conference majority and Latin American states that insisted Amerasinghe, removed from his delegate post when Sri Lanka's government changed in elections last year, may no longer be conference president.

The Latins finally were voted down by the African, Asian, Western and Communist-bloc delegations.

A third week was spent in a procedural dispute.

No nation contests the basic U.N. principle that resources in the waters beyond those controlled by coastal states must be considered the common heritage of mankind and shared fairly among all peoples.

DISPUTED ISSUE

But where that control should end remains a matter of dispute since most oil, gas and particularly fish stocks are in coastal waters, and landlocked states seek guaranteed access to these riches.

Their demands clash with the claims of more than 40 coastal nations, including some Latin American and Asian states, that have decreed 200-mile offshore limits for purposes of fishery, mineral exploitation or full sovereign control. The United States claims a 200-mile fishing limit.

Access to mineral wealth on the ocean floor off the coasts remains to be settled, as does the question of how to share deep sea mining of nodules rich in nickel, copper and manganese.

The dispute over who may fish within 200-mile limits dominated the later weeks of the Geneva session.

Rocket Recovery System

When the space shuttle project begins sometime in 1980 it will feature recoverable components. First of all the shuttle, a winged vehicle, will be recoverable. But then the two strap-on solid propellant booster rockets also will be recoverable.

The National Aeronautics and Space Administration (NASA) had the boosters designed so that after they were expended they would fall into the ocean and float vertically. But most of the casing would be filled with water. NUC came up with an answer and developed a dewatering system that would enable the boosters to be towed horizontally.

NUC developed a dewatering system consisting of a nozzle plug, a control console, and necessary support systems to insure operability and support. It was designed in a modular fashion to insure ease of modification and maintainability. To reuse the two solid rocket boosters (SRBs), a recovery system was required that would inspect the booster, prepare it for towing, and insure its intact arrival at port.

This recovery system, called the SRB dewatering system, had to meet the following mission requirements established by NASA:

- Both day and night operation.
- Operation in sea conditions up to and including sea state 4.
- Operation up to 300 feet away from the recovery vessel (horizontal range) and to depths of 175 feet.
- Operation in currents of 6 knots or less.
- Dewatering the SRB in a maximum of 3 hours.
- Withstanding all forces imposed by towing the SRB at a speed of 10 knots.

To meet NASA's mission requirements, the dewatering system consists of a nozzle plug (NP); a control console; and handling, deployment, storage, and support systems.

In operations once visual contact has been established with the SRB, the recovery vessel is positioned, a tow line is attached to the SRB, and prelaunch checkout of the dewatering system is conducted. After launch, the NP is navigated on the surface by an operator on the open deck of the recovery vessel to the SRB. During this phase of the recovery, the operator will have visual contact with the SRB, the handling crew, and the NP, and will use the remote thruster control unit. When the NP is in the immediate vicinity of the booster, control of the NP will be shifted to the main control console.

The NP will be maneuvered around the SRB, which will be floating in an upright or spar condition with the nozzle down, for inspection by the NP's onboard television camera. Once the SRB's condition has been ascertained, the NP will be driven down below the SRB's nozzle. The nozzle area will then be inspected by the operator using the television camera.

After a thorough inspection of the nozzle, the NP will be maneuvered into the nozzle. When the NP is properly docked within the SRB, docking sensors on the NP will illuminate an indicator on the control console and the locking arms on the NP will be extended to maintain the NP in the SRB nozzle. The two-step dewatering process will then take place.

Compressed air, supplied from the recovery vessel through a pneumatic umbilical, will be fed into the SRB, forcing the water out. When sufficient water has been forced out, the SRB will become unstable and assume the log mode (floating horizontally). The sewer plug is then inflated, sealing the SRB nozzle. A dewatering hose is deployed inside the SRB and additional air is supplied, forcing the remaining water out of the SRB through the dewatering hose. When the dewatering is completed, the NP umbilical will be disconnected.

In the event that the SRB begins taking on water, the umbilical will be reconnected and the SRB will again be dewatered. Following dewatering, the SRB will be towed to port by the recovery vessel, where the NP will be removed from the SRB and refurbished if necessary.

The technology required to develop the unmanned, remotely controlled NP envisioned for the SRB dewatering system has been used in previous similar vehicles. CURV III is representative of such technology. This technology was adapted to meet the NASA mission requirements. A simulation system was designed and built that supplied critical performance criteria for the selection of the propulsion system (motor location, amount of thrust per motor, thrust direction, nozzle plug mass, drag, propulsion, time delay) and operator evaluation. A graphics computer (ADAGE) and its associated hardware and software were utilized in the development of a stand-alone realistic simulation system.

The simulation modeling produced a preliminary configuration for a hydrodynamics analysis. The final configuration provides improvement in several areas. Vertical and horizontal thrusters are paired to prevent rotational moments and horizontal thrusters are placed as high as possible to bring the horizontal drag and thrust centers as nearly in line as possible. The final configuration resulted in lowering the horsepower requirements from the preliminary model's value of 45 to 30 horsepower reduction in drag.

Studies were also conducted on thruster and propeller sizes. It was decided to use six interchangeable thrusters (two in the vertical and four in the horizontal) to provide maximum repair flexibility and minimum purchase costs. This resulted in a power requirement of 5 horsepower per thruster. Off-the-shelf thrusters in this power range operate most efficiently at approximately 1000 revolutions per minute. Sixteen-inch propellers with thrust-augmenting shrouds were found to be most efficient.

Undersea Associates Formed

Undersea Associates, Inc., an engineering and marketing consultancy firm, has incorporated in Houston. The firm's specialties include undersea technology as well as the technical and financial evaluation of marginal field subsea completion systems.

The Houston operation's sister company, Undersea Associates (U.K.), Ltd., consists of an engineering and design study group in London. There is an operations consultancy service offered from an office in Aberdeen.

Marketing, project management, administrative and technical services are provided in the Houston office. Principal officers in the U.S. operation are Mike Kelly, president, and Ross Saxon, Vice President. Address to contact is P.O. Box 331, Cypress, TX 77429. Telephone 713/469-7276.

Sea trials scheduled for wet wellhead work environment

A prototype wellhead chamber using Vickers-Intertek's Neutrabaric system of a one-atmosphere, water-filled work environment is scheduled for sea trials in 400-ft waters in April 1978. The system encapsulates the subsea wellhead and provides the one-atmosphere pressure for manned access from a standard submersible.

This technique puts men on the seabed in a working environment by encapsulating the wellhead or other equipment with one or more pressure vessels. The vessels are filled with water but are depressurized to one atmosphere. This so-called Neutrabaric working environment (*Ocean Industry*, April 1977, page 202) offers speed and ease of access thus minimizing downtime. Minimal support requirements also reduce downtime and dedication expenses. The system also offers the inherent safety of the "water blanket" plus continuous monitoring of pollution.

Main features of the Vickers-Intertek system include:

- Use of standard guide frame and wellhead equipment, flowline connection assembly, tree and valves (assembled and tested at the surface).
- Installation of the entire chamber assembly from surface by guide wire, without use of divers.
- Normally wet at ambient pressure (depressurized to one atmosphere by removing a small volume of water).
- No men are required subsea for servicing and downhole maintenance since this job is accomplished by either pump-down tools or wireline using riser or surface vessel.
- Tree and control system maintenance can be handled by manned access from a conventional submersible.

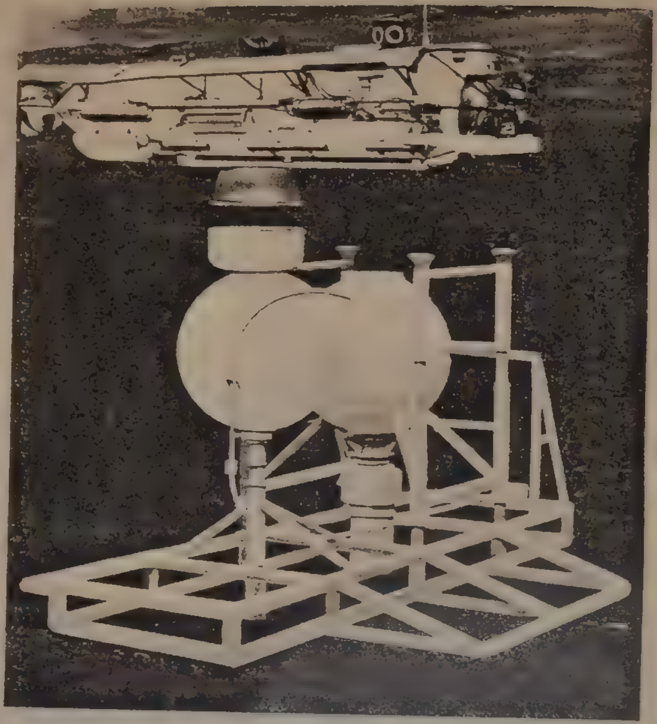
Since there are no umbilicals to the surface, the support vessel need not be anchored. Technicians move from the dry atmosphere in the submersible to the wet chamber using scuba gear.

The access point is offset directly above the wellhead. Therefore, there is no contamination in the control chamber or in the submersible.

Control pods, valve actuators, etc., may be removed or exchanged. Electrical connections may be made in either the dry or wet environment. Because the support vessel/submersible is readily available for many tasks access costs and downtime are minimized.

The "water blanket" which surrounds the technician in the wellhead chamber removes any fire risks. Earlier shop and land-based trials of the prototype unit have revealed that working in the water-filled environment creates no diffuculty as earlier thought. In fact, technicians have completed jobs faster in the water than in the air in a simulator. Emergency escape procedures have been reduced from minutes to seconds with the maneuverability the water gives.

Accidental damage from trawls or other dragging gear is also reduced by the system's protection. Pollution can be monitored continuously and any minor leakage contained.



ARTIST'S CONCEPT shows submersible ready to mate with pressure vessels which encapsulate the subsea wellhead.

The prototype unit constructed for the sea trials consists of five main components:

- ▸ THE BASE FRAME which supports a dummy wellhead with a 30-in. conductor pipe, a 13⅜-in. wellhead body and a guide frame plus standard 144-in. pitched posts.
- ▸ THE INTERMEDIATE FRAME which is the support structure for the encapsulated completion and an additional flowline and services carrier frame which links the seabed lines and the removable wellhead chamber.
- ▸ THE WELLHEAD CHAMBER encapsulates the wellhead equipment with a steel spherical pressure vessel 11 ft in diameter, and the control chamber, 10 ft in diameter, surrounds the control equipment and power pack.
- ▸ THE DOCKING CHAMBER attaches to the control chamber providing mating interface with the submersible. The chamber also houses services for electrical, hydraulic and Neutrabaric control and life-support facilities of the wellhead unit.
- ▸ THE SUBMERSIBLE is not part of the prototype unit, but is standard offshore equipment.

The prototype chambers have been designed for certification to an operating depth of 600 ft. The operating depth of currently working submersibles is 1,500 ft, but Vickers sees few restrictions in producing a system capable of operating at 2,000 ft or even greater depths.

Future needs in underwater service

Patrick F. Dowland, Group Diving Officer, The British Petroleum Co. Ltd.

The underwater use of men and machines is generally confined to the installation of platforms, the laying and sometimes burial of pipe lines and the inspection, maintenance and repair of these pipe lines and platforms. In addition and unrelated to these operations is the need to support the drilling operations which precede these activities.

Adequate, but often imperfect, techniques exist to achieve this work, in familiar depths of 0-600 ft or so. However, drilling operations and construction programs are well under way in far deeper depths. The truly diverless subsea system is not far off and there is a taste of the Arctic in the air.

Manned intervention using mechanical tools and supported by comparatively simple bells and chambers, which differ little from those used 10 years ago, has provided the most effective service available to accomplish major oilfield tasks. The sole exception is the use of submarines for route surveys and pipe line inspections.

These diving systems have been sophisticated, usually by adding electrical measuring, monitoring or recording devices, by using custom-made integrated umbilicals and elaborate heave compensation devices. In most cases these actions have markedly increased equipment failure leading to unacceptable operational downtime and a return to the philosophy "Simple is Safe" which has been shown to pay.

For some years unmanned vehicles of various types, the lock-out submersible and JIM have been available. None of these excellent ideas has so far achieved much practical impact because of deficiencies in either physical robustness, versatility or endurance.

All these systems have cut their teeth in 1977. Sometimes the experience has left painful scars but these scars will heal and the teeth will sharpen. The advent of the custom-built diving ship of both monohull and semi-submersible design to add to the existing fleet of ship conversions also came in 1977. This considerably improved the capability to dive in bad weather, supported by adequate craneage and deck space.

Introduction of these systems would seem to encourage some changes. Surely the diving ships with their sheltered, built-in equipment are in a position to accept the integrated umbilical capable of passing good communications and uninterrupted electrical signals. Improved RCV capability which is likely to occur in the coming year will make these devices much more attractive to the inspection engineer. This interest will encourage the development of specialist tools and, in particular, the improvement of TV presentation which is currently limiting the use of these vehicles for detailed work.

Introduction of submersible lock-out has hastened the commercial use of closed-circuit breathing apparatus. This equipment has, as yet, a short track record outside its military use but has now been accepted with confidence by those using it. Together with the other helium saving equipment the lock-out should be used more frequently in the coming years. The lock-out submarines may well be used increasingly in the future but they must increase their launch and recovery capability if they are to be in true competition with the specialist diving ships and those operating from them still require better heating arrangements than are currently available. When this has been solved, the breakthrough in battery technology will unleash the potential of these boats.

The increasing depth of drilling operations, in which deck load capacity is at a premium and quick response to wellhead problems is still vital, demands the replacement of saturation diving-spreads by alternative devices. Unfortunately JIM and its following prototypes have been slow in coming. But there is no doubt that the coming generation of small, manned, one-atmosphere equipment will find a place in the near future. This place is not only in the world of drilling but also in the area of structural inspection when close manned inspection of a particular feature is required in areas inaccessible to a diver.

Most subsea completion and manifold systems which have been installed over the past few years have needed unanticipated diver intervention during their installation. The requirement has come not necessarily because of system shortcomings but more often through human failure in rigging and seamanship at the surface.

Improvement should now take place rapidly and the true diverless system will soon be here. The seamanship problem, however, is as old as man. Efficient tools, devised for use in conjunction with divers or otherwise, will always be needed to recover such situations.

How then will the needs of the future differ from the existing task? Not much, in that most offshore development will probably remain within the water depths already being worked in. The proportion that will be in even deeper water is likely to be a relatively small part of the total. The challenge lies in the improvement of existing services and the safe and efficient extension of these services into deepwater and Arctic conditions.

The quality of existing services developed over the past 10 years and concentration on manned diving will remain the most economic and versatile methods of carrying out most subsea work. Lessons learned in this area are generally applicable to the development of other means of achieving the goals.

Much downtime on manned systems occurs because of mechanical and electrical failure. These failures generally occur in the system itself rather than in the ancillary equipment such as breathing apparatus or tools carried by the diver. Failures can range from rare occurrences, such as occlusions in the steel of chambers through to the frequent experience of microphone malfunction in a communication system. Often, the cause of trouble in electrical and hydraulic lines and connectors is an apparent lack of appreciation of the type and magnitude of pulling or twisting motion likely to be met at the connection point. In other areas, failures occur through lack of attention to giving lines a fair lead or through simple lack of respect for the delicacy of some equipment.

Conditions in which this equipment is used are rugged, and the effects of pressure, salt water, vessel movement and the power of waves are not to be treated lightly.

In spite of all the experience, both by manufacturers of equipment and by those who use it, there remains a suspicion that the level of proving and testing of new equipment to meet these conditions is less than the circumstances demand. The importance of rigorous maintenance disciplines may not be sufficiently emphasized.

One still hears the cry of the designer, that he never expected his equipment to get the rough treatment it received, echoed by the complaint that the gear has been poorly designed and the design team should put in more time at sea. Better communication between the field and the manufacturer and better testing and training facilities for men and equipment is needed if we are to make the best use of the equipment.

Tools available as aids to diver efficiency have proved adequate for the task. There is now a pressing need for better underwater inspection equipment and for even clearer helium speech unscrambling, so that videotape taken deep can carry a spoken commentary by the diver which is intelligible to the layman and for processes and techniques for data logging and retrieval. Improved cutting and welding techniques, particularly for use at great depth, are wanted now.

Inspection of structures and remedial work will clearly be a growth area where divers working from both surface ships and submarines will share the inspection work with the RCVs. The ratio cannot be forecast since the RCV performance is likely to improve considerably with experience. What is certain however is that remedial work will be diver intensive.

The usual jobs associated with pipelaying, burial and the work required in conventional platform setting and pipe line tie-in will all remain diver intensive. Where subsea completions are concerned, improved design will, within five years, reduce or eliminate diver intervention.

In drilling operations, diving other than surface diving will be phased out as one-atmosphere systems become more effective.

Because a man on the spot is difficult to replace with a TV screen and a manipulator, devices relying on this combination clearly have a firm place in the toolbag, their usage will be limited until technology improves their capability. Similarly, the one-atmosphere systems usage will be limited by their manipulative powers.

What is required of men working at ambient pressure?

The client will continue to wish to contract a package of high quality skills. Competent divers, who have mechanical aptitude and a knowledge of rigging, who can read an engineering drawing and who can communicate in the language of engineering are wanted. Experienced supervisors with good leadership qualities are wanted. Some engineering graduates who can play a part in planning and problem solving are needed. If the service required needs specialist skills such as photography, welding, NDT or data collection and report writing, then the men put forward must be professionals.

In 1979, the underwater work requirement in the North Sea will increase dramatically if present plans stay on schedule. Whether you operate divers, submarines or other tools, you do not have long to gather the competent work force required. Hopefully, companies will think ahead to make certain that we build on present knowledge and insure that the levels of training and experience are sufficient to meet this greater need.

Osel *Mantis* sold to Star Offshore

Through its subsidiary *Star Subsea Maintenance*, *Star Offshore* has purchased a *Mantis* one-man atmospheric submersible from *Osel*, to be delivered this year. The company also took an option for a second unit.

Norwegian Firm Orders Undersea Vehicle From AMETEK Of California

Stolt-Nielsens Rederi A/S, Haugesund, Norway, has placed an order with AMETEK, Straza Division, El Cajon, Calif., for a Scorpio undersea vehicle system. The Scorpio will be operated by Seaway Offshore Service, which is owned and managed by Stolt-Nielsens Rederi.

Seaway will use the Scorpio for its North Sea operations, and plans to deploy the vehicle from the Seaway Sandpiper for underwater services related to their contract to cover part of the Ekofisk-Emden gas pipeline which extends across the Danish sector. AMETEK, Straza Division will train the Seaway operators and maintenance technicians, and will provide installation and operational field services.

Stolt-Nielsens Rederi placed the order after witnessing a highly successful sea trials demonstration of the Scorpio system off Santa Catalina Island in January 1978.

For a complete description of the Scorpio undersea vehicle system, write to D.W. Given, AMETEK, Straza Division, 790 Greenfield Drive, El Cajon, Calif. 92021.

Hydro Products, a division of **Tetra Tech Co.**, has been awarded a $1.1 million contract by the Japanese navy to build an undersea remote-controlled vehicle to be used for ocean floor surveys, assessing damage to underwater objects, and recovery of lost items.

International Paint Announces Self-Polishing Hull Coating That Reduces Operating Costs

A new self-polishing copolymer antifouling called SPC, with the unique ability to be polished smoother by water friction, has been announced by International Marine Coatings, the heavy marine division of the International Paint Company, Inc. SPC will soon be available in the U.S., having proven itself abroad since 1974.

This revolutionary new concept in antifouling technology actually reduces the frictional resistance of a ship's hull as it passes through the water. Not only can the ship maintain optimum design speed, but also use significantly less fuel — up to 12 percent.

SPC chemically combines the antifouling agent and the medium which carries it. Instead of requiring that the antifouling agent leach through the medium as conventional antifoulings do, the SPC coating itself retains its antifouling properties throughout its life. Water turbulence polishes the high spots first, resulting in a progressively smoother surface.

The life of SPC is directly proportional to its thickness. A standard three-coat system will last two years or longer and can be visually inspected to monitor rate of polishing since different colors are used. In addition, recoating is easier because only a high-pressure water-wash and repair of mechanical damage is required before recoating.

The coating is recommended for new construction or after proper surface preparation on hulls which are in good condition. While initial application is more expensive than a conventional high-performance antifouling system, International Marine Coatings claims that fuel economy, speed maintenance and reduced drydocking costs and extension of drydocking frequency produce a very attractive return on the investment.

For descriptive literature, write to W. **Norman Duncan**, International Paint Company, Inc., 17 Battery Place North, New York, N.Y. 10004.

Huge Lava Lake Remnants Found Off Coast Of Baja

By CLIFF SMITH

Science Writer, The San Diego Union

The cold remnants of lava lakes that spring up white hot on the ocean floor and live briefly in a molten state despite the tremendous quenching power of the sea have been discovered in the Pacific.

The lakes of liquid rock, as large as two football fields, form natural depressions along the crest of the so-called East Pacific Rise, a volcanic zone of sea floor spreading south of Baja California.

A phenomenon previously unknown in oceanography, the lake remnants include lava pillars up to 50 feet tall that in places stand together, their tops connected by rock arches, to resemble the ghostly remains of sunken Greek cities.

Described yesterday at a news conference at Scripps Institution of Oceanography, the discovery was made recently two miles beneath the ocean surface south of the tip of Baja California.

A total of 21 manned submersible dives to the sea floor were made by scientists from France, Mexico and the United States during the expedition. It was part of a three-year, $3 million program to probe the dynamics of the earth's mobile crust and was being managed by Scripps under the direction of Dr. Fred N. Spiess.

Scientists in 1974 dived to the bottom of the Mid-Atlantic in Project FAMOUS (French-American Mid-Ocean Undersea Study) and witnessed the extrusion of molten lava in small amounts from an ocean floor ridge.

But no evidences of lava outpourings on the stunning scale found south of Baja have ever been known before.

"A few years back if someone had said you will find lava lakes on the floor of the ocean, people would have laughed," said Dr. Jean Francheteau, chief scientist of the recently completed expedition.

"In FAMOUS we didn't find lava lakes and everybody talked about how rapidly lava is quenched on the sea floor . . . It didn't seem possible that they (lava lakes) could exist.

"They must be created at times of very, very rapid outpourings of lava that fill natural depressions on the seafloor."

Francheteau said the lava pillars observed on the bottom stand as "frozen witnesses to the height the lava lakes reach" and as terraced "dipsticks" that record the progressive lowering of the lava lake levels as the molten rock spewed out across the ocean floor.

Curiously, the scientists found, the pillars are hollow; like pipes. Francheteau proposed a mechanism for their formation:

Some pools of water were caught under the outpouring lava and after being superheated these pools shot to the surface of the lava lake, quenching and solidifying molten rock to form hollow columns during the ascent.

The great rift where the lava lake remnants were found marks the boundary between two big chunks of earth crust called the Pacific Plate and the North American Plate. Along this boundary, where it is covered by the Pacific, liquid and plastic rock is welling up to form two carpets of new sea floor that roll out like conveyer belts, one going west and the other east.

The boundary continues north through the Gulf of California and breaks out on land as the notorious San Andreas Fault, the source of most of California's earthquakes.

The recent expedition was part of a project called RITA, an acronym referring to the Rivera and Tamayo fracture zones that cross the East Pacific Rise in the diving area.

Speed in Forming Ocean Policy Urged

Rep. William V. "Bill" Alexander (D-Ark.), despite coming from an inland state, is an avid skindiver holding a SCUBA qualification card. He has been a principal proponent of ocean programs in the House of Representatives, espousing especially the Oceanlab program of the National Oceanic and Atmospheric Administration. Now House Deputy Majority Whip, he received a law degree from Vanderbilt University in 1960.

ST SOAPBOX

Why should Americans who live in places about as far from ocean coastlines as is possible be concerned about whether their federal government has a coherent, comprehensive ocean policy?

Three and a half centuries ago John Donne, in his "Devotions" gave us the answer:

"...No man is an island, entire of itself; every man is a piece of the continent, a part of the main...."

In a very real, measurable physical sense, we are all profoundly affected by the ocean environment. The pollutants that enter the rivers, lakes, and oceans show up sooner or later in all of us — through the food we eat, the water we drink, and the air we breathe. Our weather and climate are spawned in the oceans. Our need for ocean minerals, food, and energy; and, our dependence on the oceans for shipping are problems shared by all states. These problems demand national attention.

It has been recognition of a shared interest in the future of our oceans, and what our Nation makes of that future, that has prompted me to take an active interest in urging the development, adoption and implementation of a comprehensive, national ocean policy.

The lack of such a policy and the slowness with which our government has been moving toward implementing one is deeply disturbing.

As our land based resources, particularly food, energy, and essential minerals, move even nearer to depletion the importance of the ocean treasure house increases. And, the conflicts deepen and grow more heated over who will benefit from the largess of our oceans and how much they will benefit.

For a nation, such as ours, with thousands of miles of coastline, the oceans are an essential element in our national security. We can not afford to fail to make full use of this national defense resource.

In our struggle to reduce the red ink impact of imported petroleum on our national economy, the oceans provide the last major source of fossil fuels and natural gas available to us. In the near term, wise and accelerated development of U.S. continental shelf energy resources offers the only real hope of reducing our petroleum imports.

The list of uses for which we can develop our ocean resources, particularly energy resources, is limited only by the inventiveness, the drive, and the commitment of our nation.

Our objective must be a coordinated policy of ocean development, conservation and protection. Achievement of this objective rests heavily on the ability and and willingness of our government, industry, institutions, and the scientific community to cooperate and, where necessary, to work out the compromises needed to serve a proper balance of national interests. Failure of these elements of our society to work together can only result in confusion and conflict and foster a continuation of the piecemeal time-and-resource-wasting policies of oceandevelopment, conservation and protection that now hamper us.

When she appeared before the House of Representatives Committee on Appropriations subcommittee dealing with her Department's budget, Secretary of Commerce Juanita Kreps gave reason for optimism about the Carter Administration's ocean policy intentions. She and other Commerce officials testified that ongoing, comprehensive analysis of all aspects of ocean policy could lead to a Presidential proposal for a comprehensive ocean policy this summer.

When I pushed in 1976 for the funding of an underwater, ocean research laboratory effort within the Department of Commerce it was with the hope that such a program would add momentum to the development and implementation of such a policy.

The objective of the laboratory project is the development and acquisition of a new capability by the United States to carry on manned undersea science and technology efforts.

It is the first such project to be launched by a federal civilian agency. In its analysis of the feasibility and need for such an effort, the National Oceanic and Atmospheric Administration (NOAA) has been working with a wide array of federal agencies, as well as the scientific and commercial communities which might be interested in using the facilities of an underwater, ocean research laboratory.

Within the federal government alone the examples of the kinds of possible missions, tied to current projected agency programs, for such a laboratory project include study of problems and possibilities relating to: ocean energy production, disposal of radioactive waste, diver safety, pollution monitoring, marine biology, production and biomedicinals from the seas, management of Arctic ice and dredge spoils, sea floor engineering and oil production monitoring.

The dialogue engendered by the project study has helped pull together a clearer, more coherent, and more comprehensive discussion of the kinds of mission needs existing in the area of ocean research and development. There has been an increase in the communication between the government, the academic community, the scientific community, and the business community on the range of facilities that could best be used for accomplishing ocean policy and research objectives. These, of course, include ships, submersibles, buoys, remotely controlled unmanned vehicles, fixed observation systems and platforms, aircraft and satellites.

It is to be hoped that the combination of the ocean policy analysis work underway in the Executive Branch and the study of possible ocean research missions will provide a sound, realistic basis for formulating and implementing a comprehensive national ocean policy.

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

NOVEMBER,1978

Vol. XII, No. 4 Published by the Deep Submersible Pilots Association

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER should be addressed to:

Robert K. R. Worthington
Editor, DSPA
3005 Curie Street
San Diego, CA 92122 (714) 453- 1158

Correspondence regarding new member applications should be addressed to the Membership Committee Chairman, as follows:

Willis Forman
1527 Linwood Street, Apt. 5
San Diego, CA 92103 (714) 295-0620

EDITORIAL NOTES AND COMMENTS

It is hoped that no one saw the April dateline on the July NEWSLETTER and deep-sixed it without perusal. OK, so I blew it! I made last minute corrections on most copies.

An issue of vital importance, particularly to the builders and operators of the smaller deep submersibles, arose at the Londonconference on submersible safety. Wording of the MTS "Safety Standard Guidelines" (certain to be embraced by the ABS, insurers, and ultimately the U.S. Coast Guard) may preclude acceptance of any grounded electrical system, no matter the use of low voltage and proven safety and reliability of the system. An exchange of correspondence on the subject between Merle Wilson and Doug Privitt (NEKTON) on one side and MTS Committee Chairman John Pritzlaff on the other is included in this NEWSLETTER. Members with definite opinions and experience pro and con are urged to write to me or to the above parties with a copy to me.

Attendees at the October San Diego luncheon meeting had a fascinating visit to AUGUSTE PICCARD at her pierside berth at Shelter Island. At 93' LOA, she is almost out of the "minisub"class and will be a revelation to all DSPA-ers. Jack Bennett advises that present intentions are for local operations until February ere resuming her voyage to Mobile via the Panama Canal. In the meantime, DSPA-ers will be welcome visitors, I am sure. PICCARD's presence brings to ten the number of research submersibles based at or operating from San Diego, including DEEP QUEST, NEKTON's (3), TRIESTE, SEACLIFF, TURTLE, and the DSRV's (2).

DSPA San

Doug Privitt and Larry Megow rate special thanks for their frequent contributions of news items and helpful ideas to your Editor and Secretary.

SECRETARY'S REPORTS AND NOTICES

Election of Officers--Due to lateness of ballots, it is proposed that the officers elect will take office 1 January 1979 and serve through 1979. Elections for 1980 will be held in mid-79. Any Members objecting to this procedure should communicate with the Secretary. The 1979 officers will be as follows:

R. Worthington- President
J. Cameron - Vice President
D. Saner - Secretary
G. Shiller - Treasurer
D. Keach - Legal Officer
W. Forman will continue as Membership Chairman
R. Worthington will continue as Editor

Address List Corrections--Note that the last page of each NEWSLETTER is usually devoted to address list corrections so that it may be detached and attached to your DSPA June 1978 ADDRESS LIST.

European Branch of DSPA--Alan Whitfield is congratulated on his success in forming the IUPA (International Underwater Pilots Association) with 15 members. The degree of relationship with DSPA has not been established. Alan's message arrived by slow boat via China, taking over two months to reach San Diego!

Dues for 1979--Since some Members have paid all or part of next year's dues, it is planned to include a statement of each individual's dues status with the next Newslatter mailing.

NOTICE

ALL D.S.P.A. PILOTS

PLAN NOW TO ATTEND A D.S.P.A. MEETING ON WEDNESDAY, MAY 2, 1979 DURING O.T.C. IN HOUSTON. ADVISE ROBERT K. R. WORTHINGTON OR LARRY MEGOW BEFORE DECEMBER31, 1978 IF YOU PLAN TO ATTEND. (or ASAP)

DSPA San Diego Luncheon Meetings

7/7/78---Members Present

Bob Worthington
John Cameron

Non-Members Present

Jack Bennett-AUGUSTE PICCARD
Pat McGahan-MYSTIC (DSRV-1)
Bob Martin- "
Mel Wills-DEEP QUEST

Met at 1145 at Mexican Village in Coronado.

Captain Jack Bennett, USN (Ret), related the story of AUGUSTE PICCARD, from Switzerland to Canada to the pending voyage from Vancouver to Mobile. She is now a 2300-foot depth research submarine with, hopefully, a busy future in Gulf of Mexico operations. Jack is looking for experienced personnel to augment his crew and also for a man to set up and run a support base in Mobile, Alabama.

Treasurer Don Saner's report was received and noted. The DSPA bank balance as of 7/7/78 was $1672.10.

9/25/78---Members Present

John Cameron
Bob Worthington
Doug Privitt
Jerry Shiller
Merle Wilson
Will Forman
Don Rosencranz

Non-Members Present

Jack Bennett-AUGUSTE PICCARD
Ken Privitt-MARFAB, Inc.

Met at 1145 at Tarantino's in San Diego.

Jack Bennett reported that AUGUSTE PICCARD had reached Bellingham, Washington, on her journey south from Vancouver and should arrive at San Diego in a few weeks. She is traveling on her own power with a tug escort. Jack displayed a photo of the submersible with her auxiliary sail rigged! It is hoped to increase transit speed with favorable winds by as much as two knots.

Merle Wilson reported on his attendance at the London Submersible Safety Symposium. He took strong exception with the Conference's taking an unequivocal stand that all submersible electrical systems be ungrounded, isolated from the hull. The NEKTON's are ABS approved and have made several thousand dives without electrical problems or any sign of hull electrolysis resulting from their 24-48 volt single wire, grounded system. While agreeing that the ungrounded system requirement is probably valid for higher voltage systems, there appears to be no reasonable objection to a properly designed low-voltage system such as has been successfully utilized in the smaller submersibles, e.g., ASHERAH, STAR I&II, DEEP VIEW, and the NEKTON's. Doug Privitt's new submersible design (probably NEKTON DELTA) is nearing completion, and Doug adamantly insists that the low-voltage system of the grounded type is the best for this type submersible. General Oceanographics personnel, Rosencrantz, and Forman strongly supported him.

REPORTS

Due to the above dis~~s~~cussion, Larry Shumaker's recommendation that DSPA contribute funds to help print the MTS "International Safety Guidelines for Operation of Undersea Vehicles" was deferred by consensus until it is ascertained that the utility of such systems is recognized therein. The impact of the MTS publications on insurance, ABS, and future USCG Rules and Regulations may be expected to be profound; and DSPA certainly sill not give tacit support with the foreknowledge that they contain a specific defect that will impose a grave and undesirable restriction on the smaller submersibles. Have any DSPA members reviewed the completefinal draft and concurred with it?

Due to Kevin Parker's departure from the UK area to the USA and now being unable to administer procurement of jacket emblems as hoped, a local (San Diego) source will be investigated.

The next meeting will be held on 23 October and will include a post-luncheon visit to AUGUSTE PICCARD.

10/23/78---Members Present

Bob Worthington
Merle Wilson
Jerry Shiller
Doug Privitt
Don Saner
Garroll Hoyt

Non-Members Present

Jack Bennett-AUGUSTE PICCARD
Bob Eastaugh- "
Fred Wagner- "
Ken Privitt-MARFAB, Inc.
Jerry Rhoades-DSRV
Mel Wills-DEEP QUEST
Al Smith- "

Met at 1145 at Tarentino's.

AUGUSTE PICCARD personnel described their surface transit from Vancouver to San Diego with stops at Bellingham and San Francisco under tug escort. Major problems were a balky head and a 20-hour period with the conning officer marooned topside in the "fin" (redesignated to avoid confusion with the real, honest-to God sail rigged to increase diesel transit speed). The hatch could not be opened without dumping water onto the main notor below. After a layover on San Diego, PICCARD and escort will depart for Panama enroute Mobile.

After further discussion of the NEKTONsingle-wire electrical system problems that have emerged with ABS since the London discussions on the subject, the meeting adjourned to the Shelter Island berth of PICCARD for a tour. The 93-foot submersible was very impressive with its twin diesels, 6 bunks,"real submarine" attributes, plus the hydraulically raised mast and sail handling from the "fin. The installation of equipment and wiring is extraordinarily well done, the space within the long hull being well utilized.

Notice--Any Member who never received a Membership Certificate may obtain one from the Secretary. Please furnish the approximate date of your initial membership.

REPORTS FROM MEMBERS

Jack Donnelly (7/20/78)

"Since May of '77, I have not been with ALVIN but instead have worked with ALCOA SEAPROBE here at Woods Hole. Presently, ALCOA is fitting her out for coring and expects to sail about 1 August. At that time I will be seeking new duties at the Oceanographic."

Kevin Parker (7/21/78)

"I am pleased that the DSPA has accepted the design for the badge. I would be pleased to market them in Europe, however----- Two months ago, we at P.O. SUBSEA were told one morning that the board had decided to sell all or some of their assets. This came as a shock to everyone, especially the two crews on SUBSEA ONE/MERMAID THREE,as they had all worked very hard the previous six months and seen the unit work up to repetitive 3 1/2-4 hour lockouts and in one case a 6-hour lockout at 560'. As you will appreciate, no one else can or could touch us on this. Had the Board decided to stay in the game, this unapproachable lead in the field would have seen us leaders in 1-2 years time.-I left the company at the end of June and Steve Davies, the Senior Pilot on MERMAID's other crew (who has applied for membership and heard nothing) and I start work for Hyco Subsea on August 4th.-LEO is on bareboat charter to Hyco working in the Gulf, and I am looking forward to seeing some old friends, Boggs, Widcum, and Bob Starr if I can find his office in Houston.-All correspondence can be sent to me or Steve at Hyco Subsea Houston."

Larry Shumaker (7/24/78)

"I'm leaving today for the Azoresfor three weeks. ALVIN WILL reach Punta Delgada tonight. We will conduct geophysical and geological investigations of the Mid-Atlantic Ridge until the end of August then return to Woods Hole for a series of dives off the coast here for National Marine Fisheries. In October, we head south again for operations in the Bahamas and Puerto Rico. In January, we will transit the Canal and operate off the Galapagos until mid-March when we will transit north and operate off the tip of Baja Californiaduring April. We should arrive in San Diego for a short upkeep in late May and operations off California through September. More on that later.- The International Safety Symposium was excellent and we expect to have the book out by March. Along those lines, I would like to propose that DSPA contribute $250 to MTS to help with the publication of the book. Publication is not covered by the contract under which we've been working--let me know what you think."

Alan Whitfield (7/27/78)

"I am on LR4/BORGHOLM at the moment. I have just returned from Norway, where we recovered a Sikorsky helicopter from 770 feet in the Norwegian Trench. The aircraft had broken into three sections, which we located with sidescan sonar. I then dived LR4 and attached lifting lines to the wreckage. The ship then lifted everything to the surface, once the submersible had veen recovered. We managed to locate and find all the instruments, rotors , and other small important items which were not lifted with the main wreckage, also five of the helicopter crew members were brought to the surface.- The European Branch of the DSPA (called the IUPA (International Underwater Pilots Association) is off the ground with 15 British pilots. I'll send you more details, plus our quarterly newsletter, later."

Hal Criger (7/27/78)

"Spent the latter part of May and most of June in Brazil diving in the Garoupa field for Petrobras. When completed in 1979, Lockheed Petroleum Systems will have nine wellhead cellars and one manifold center on the ocean floor. Oil will flow through the nine WHC's to the manifold center and from there through a process tower to the process ship which in turn will pump to a loading tower and into an oil tanker.--In your last Newsletter, the article pertaining to the news release on the Aero-Space Museum fire, the reporter indicated that the F6F recovered by DEEP QUEST was lost in the fire. I will correct him in that the F6F #Z-11 is resting peacefully at the Pima County Air Museum in Tucson, Arizona. The San Diego Museum had no room to display the aircraft and it was left to rot at NAS North Island. It was trucked to Tucson in 1976 as I was there in December of '76 and have pictures of her basking in the Arizona sun.--LPS now has a third operating dive sustem. At sea trials and test dives to 1200 feet were completed in May. Demonstration dives were made in Long Beach, California in July, and the ship is now enroute to Houston via the Panama Canal where more dives will be made before reaching her homeport of Houma, Louisiana."

Gary Rees (8/15/78)

"Things are great on the good ship GRAYBACK. I have around ten months left here and hopefully will be coming back to San Diego."

Vance Bradley (8/27/78)

"The Bradleys have been pretty busy of late with a new house and a new job with Hyco Subsea in Houston. I am just home from another trip to the Gulf of Mexico with HYCO. For information, AQUARIUS I has been taken out of service for a much deserved refit. Leo I,last mentioned by Kevin Parker (call him K.P. or he gets confused) is now on board the M/V HUDSON HANDLER. LEO had been in storage for quite some time and required a pretty thorough overhaul but is now fully operational. And a real beauty, I might add.—K.P. and Steve Davies came over to break in the HYCO Gulf of Mexico crew on the submersible. The HANDLER has also undergone a pretty thorough refit, and we are now satisfied that the bugs are out and the spread is ready for operations. A short contract with Chevron proved this out earlier in August. Many thanks to Ian Sanderson and others for all their help in the refit and our orientation on LEO.--I understand thet the North Sea area is now blessed with a long line of jobless submersible techs and pilots. Vickers has apparently laid off about half their operational personnel; Intersub has taken over the Comex spread; and P&O Subsea decided to close up shop. K.P. tells me there is a litter of equipment for sale at Montrose.--I have seen the embroidered DSPA badge that K.P. has and will heartily endorse it."

Larry Megow (7/26/78)

The attached synopsis of the 1978 O.T.C. might be of interest to some of our pilots. Also, attached is a copy of an article I wrote in April, 1967, about the charter organization of D.S.P.A.. It might make an interesting story about what happened to those who dropped out. (Ed Note: 4 Charter Members remaining, only Shumaker still actively piloting.)

SYNOPSIS OF THE

1978 O.T.C.

By

Larry Megow

The 1978 Tenth Offshore Technology Conference attracted almost 80,000 distinquished scientists, engineers, technicians and educators from every major country in the world. This was an almost 30% increase in attendance over the 1977 conference.

There were more than 1,800 companies from 17 countries, with spectacular exhibits covering 438,000 square feet - over 10 acres of floor space.

The exhibits covered every aspect of offshore exploration, including ocean mining, oil and gas exploration, ocean thermal power, energy and research.

In addition to the exhibits, 284 technical papers were presented at 50 sessions by 11 technical societies.

It was virtually impossible to view all the exhibits in one day, unless you had double vision and were a seasoned jogger.

Of the millions of words and thousands of expensive brochures and pamphlets, two items struck me as being important. One, despite the oil and gas shortages that are making foreign countries richer daily to the tune of around 4 billions of dollars, less than 5% or 1.5 million square miles of the U.S.A. outer continental shelf has been put up for lease! And, two; despite the great need for oil and gas and to reduce taxes, it took 18 years from the first geophysical work off the Gulf Coast in 1960, before the first exploratory well was drilled. While we were waiting those 18 years, the entire North Sea was developed.

For those of you who were not in personal attendance at the O.T.C., you can obtain the four volume O.T.C. Proceedings, which include all technical papers, from the Offshore Technology Conference, 6200 North Central Expressway, Dallas, Texas 75206. I think the price is around $25.00.

April, 1967

the slide rule

Official Publication of the HOUSTON ENGINEERING and SCIENTIFIC SOCIETY

DEEP! DEEP! DEEP!

by Larry Megow

Sixteen pilots for most of the world's operational deep submersibles met at the Houston Engineering and Scientific Society in January to organize the DEEP SUBMERSIBLE PILOTS ASSOCIATION.

Included in this distinguished group are representatives from Wood's Hole Oceanographic Institute, Ocean Systems, Lockheed Missiles and Space Company, Reynolds Submarine Services Corporation, Westinghouse Electric Corporation, General Dynamics Electric Boat Division, and the United States Navy.

All of the pilots in this charter group have been in command of undersea vehicles and have personally participated in many historic hydrospace activities including the 35,800 foot dive to the deepest spot in the oceans; the discovery and recovery of the lost atomic bomb off the coast of Spain in the Mediterranean Sea; finding and photographing of the submarine Thresher which sank with 129 men aboard in 8,400 feet of water; and in numerous oceanographic research dives, many to depths beyond 6,000 feet.

The basic purpose of the newly organized DEEP SUBMERSIBLE PILOTS ASSOCIATION is to encourage free and continuous exchange of experiences and techniques among its members, which will serve to increase safety, efficiency and potential uses for submersibles; and to promote professional standards for pilot qualification.

Larry Shumaker of Lockheed was elected temporary president; Louis Fead of General Dynamics Electric Boat, the temporary secretary and treasurer; and Dick Usry of Westinghouse, William Rainnie of Woods Hole Oceanographic Institute, and Cmdr. Don Keach, U.S.N., were elected to serve as temporary board members.

The Pilots decided to hold their organizational meeting in Houston because of its central geographic location; because of the availability of the Engineering Society facilities and because many of the Pilots had previously spent some time here while the personnel hulls for their submarines were being manufactured at the Hahn & Clay plant on Clinton Drive.

The Houston Engineering & Scientific Society, Hahn & Clay, The Astrodome, The Chamber of Commerce and the Manned Spacecraft Center all served as hosts.

Of special interest is the fact that there are less than fifty individuals in the entire world, who are qualified for membership in this unique organization.

CHARTER MEMBERS
of
DEEP SUBMERSIBLE PILOTS ASSOCIATION

1. John Barringer, Jr.	Perry Submarine (Ocean Systems)
2. Al Berryman	Moray (USNOTS) DEEPVIEW
3. Bob Canary	ALUMINAUT (Reynolds)
4. Louis Fead	STAR (General Dynamics)
5. Will Forman	DEEP JEEP (USNOTS) (Deepview)
6. D. P. Germeraad	Lockheed
7. Don Keach	TRIESTE I (USN)
8. Glenn Minard	Deep Jeep, DEEP QUEST (LMSC) Lockheed
9. M. J. Mc Camis	ALVIN (WHOI)
10. Bill Rainnie	ALVIN (WHOI)
11. Al Rutherford	STAR (EB) General Dynamics
12. Bob Serfass	ALUMINAUT (Reynolds)
13. Larry Shumaker	TRIESTE I, TRIESTE II, DEEP QUEST (LMSC) Lockheed.
14. Don Walsh	TRIESTE I (USN)
15. Val P. Wilson	ALVIN (WHOI)
16. Dick Usry	DEEP STAR 4000 (Westinghouse)

Larry Megow (8/10/78) (9/26/78) (9/27/78)

"For the first meeting of the Texas Section of DSPA at the Houston Engineering & Scientific Society, ws had only 50% attendance - Boggs. Saxon and Megow. Macdonald, Smith and Starr failed to make it.-- The second meeting also had 50% attendance. - If you concur, the Houston Dection will host (Dutch) the San Diego, Woods Hole, Canadian and Washington Sections, as well as all the at-large members over the world at OTC, May 2, 1979. Had the opportunity to visit Martech's interesting diving facility at 13550 Hempstead in Houston. Spent some time with Chief Pilot Bob Starr and Pilot Gordon Barksdale. Martech's PIONEER I got in the news as well as on local TV."

Ron Rau - Non -Member (10/16/78)

"DSRV-1 (MYSTIC) was standby rescue vehicle at Rescue Unit Home-Port, North Island at San Diego from the beginning of June until the presene. Only routine checkouts and weekly wet tank testing were conducted. In September, the DSRV-1 system was flown to Providence, R.I., to participate in New London submarine rescue training operations. The RV and the Land Transport Vehicle were loaded on a C-141; and the rest of the system, along with the crew, were loaded in a C-5A and flown cross country. The RV was transferred to New London and loaded on the back of PINTADO (SSN-672). Very successful operations were then conducted in which the RV launched and recovered from the nuclear submarine submerged. Upon return to San Diego, DSRV-1 resumed standby status at RUHP.

"DSRV-2 (AVALON) went into major maintenance status in June and will remain in this condition until the end of November. This is the first major overhaul since the vessel went into operation five years ago. the pressure capsule was removed for ultrasonic inspection and preservation, all tubing was hydrostatically tested, and all equipment was refurbished. At present, the vehicle is in process of being reassembled. Modifications have been made, e.g., field joint flanged bolt rings-to allow greater flexibility in opening and closing sections for maintenance, buoyancy pod additions- to allow greater payload, access door additionsto allow more accessibility to equipment through the outer skin, and the addition of a new Vertical Obstacle Sonar in the bow section.

"DSV SEA CLIFF conducted local operations for training in June and spent the next three months in the Hawaiian area on the support vessel MAXINE D. Rough weather inhibed successful operations there, and only a few dives were made. The vessel is back at RUHP now preparing for local operations with DSV TURTLE.

"DSV TURTLE has been at RUHP under overhaul this past summer and is now just completed. The principal alteration accomplished was the modification of the lift system to allow a single point lift. Local ops are planned for the rest of the year."

Don Saner (10/20/78)

"Following a three-year period of idleness, DEEP QUEST was activated and modified and is currently being utilized to test a hydrogen/oxygen fuel cell for the Navy. The fuel cell system replaces the DQ after battery and provides 120 VDC output of up to 30 KW. With the H2 and O2 tanks pressurized to 3000 psi, the system can provide a maximum of 750 KWH. A series of dives to a maximum depth of 5000 feet are in progress with additional dives planned for October and November."

DEEP QUEST LIFE SUPPORT SYSTEM

by
Donald E. Saner

A potassium super-oxide (KO_2) life support system has replaced the previous high pressure oxygen/lithium hydroxide system in Lockheed's DEEP QUEST. The KO_2 system consists of two major assemblies, the "Emergency Breathing System" (EBS) and the "Normal Breathing System (NBS).

The EBS is made up of three major assemblies: the exhalation manifold, the KO_2 canister, and the inhalation manifold. EBS can be utilized in either a closed or open loop operating mode depending on the presence of a contaminated atmosphere in DEEP QUEST during an emergency situation. In the closed loop mode of oparation, both exhalation and inhalation face mask hoses are connected to their respective manifolds by means of quick-disconnect fittings, and the crewmen use only the atmosphere in the EBS, isolating themselves from the contaminated cabin atmosphere. KO_2 chemical in the canister removes CO_2 from the crew's exhalation gases and generates O_2 to replenish the inhalation gases. In the EBS open-loop mode, the exhalation hose is connected and the inhalation hose is left disconnected. Each crewman is thus inhaling from the cabin atmosphere and wxhaling into the exhalation manifold, forcing expired breath through the KO_2 bed. Each KO_2 canister is estimated to have a minimum of thirteen hours capacity with four men in the open-loop mode.

The NBS is used during all normal dives. When the NBSis put into operation, the cabin air is drawn through a KO_2 canister and circulated through the cabin by a blower. The KO_2 camoster capacity is estimated to be twelve hours when operated in the NBS mode. An automatic control sustem consisting of a reference chamber, a pressure transducer and control valve monitors and automatically controls the O_2 and CO_2 levels within the pressure hull.

The DEEP QUEST previous Li/O_2 system could sustain four men for a total of 48 hours. The new KO_2 system canprovide up to 108 hours of life support under the same conditions without increase of space or weight requirements.

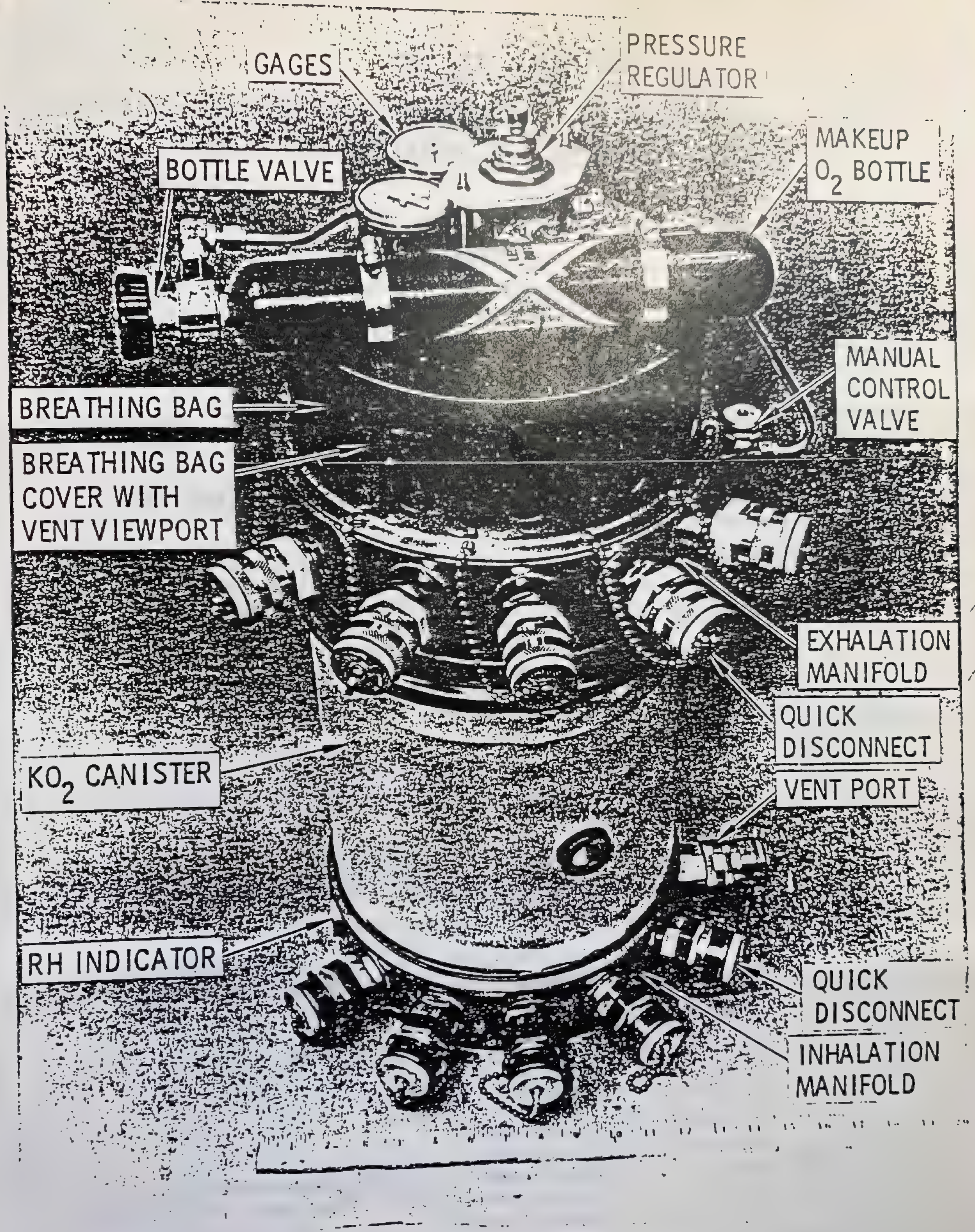

GAGES
PRESSURE REGULATOR
BOTTLE VALVE
MAKEUP O_2 BOTTLE
MANUAL CONTROL VALVE
BREATHING BAG
BREATHING BAG COVER WITH VENT VIEWPORT
EXHALATION MANIFOLD
QUICK DISCONNECT
KO2 CANISTER
VENT PORT
RH INDICATOR
QUICK DISCONNECT
INHALATION MANIFOLD

Figure 1 Emergency Breathing System

I.S.E. GULF
INTERNATIONAL SUBMARINE ENGINEERING GULF INC.
3915 B DACOMA, HOUSTON, TEXAS 77092 • [713] 681-8816
TELEX 04-353554

September 14, 1978

Deep Submersible Pilots Association
c/o Mr. Robert Worthington
3005 Curie Street
San Diego, CA 92122

Dear Bob:

Please excuse the tardiness in getting this letter and dues (please forward) in the mail.

I.S.E. GULF, INC. has been in its new premises in Houston for a month now, and a very busy first month has been had by all. I.S.E. GULF has been established to provide

- engineering services
- vehicles and spares
- subsea equipment

and generally provide our customers with support as required. The present status of TROV's and TREC's is as follows:

TREC P (Prototype)	has been working in the Gulf of Mexico all summer and has just come off charter.
TREC 1,2,3	are owned and operated by Martech in the Gulf of Mexico, They are all working at present under the direction of Bob Starr.
TROV S-4	has just been converted for operation to 3000 ft. It is currently on its way to Spain for a 60 day charter involving visual, side-scan, & sub-bottom inspections of the proposed Algiers/Spain pipeline route. S-4 is owned and operated by Ocean Systems in Houston. Allen Baldwin will be with them in Spain for a few weeks.
TREC 4,5	start sea trials in Vancouver Sept. 14. T-4 is for Horton Maritime. T-5 is for Ocean Systems.

TREC 6 TROV 6&7 are under construction for Ocean Systems.

Mr. Lynn Dates, formerly of Oceaneering and ODOM, and most recently Comex, has joined our staff in Houston. Others will be added as the business grows, as it shows every sign of doing.

Anyone interested in this area of sub-sea work is invited to contact me at the above address.

The recent refit on TROV S-4 has kept me extremely busy. Now that it is off to Spain and things have settled down to a dull roar,I will be contacting Larry Megow and hope to get together with local D.S.P.A. members in the near future.

I would like to thank you Bob, for continuing to publish the NEWSLETTER. We all appreciate the effort.

Yours sincerely,

M.D. Macdonald
Vice-President/General Manager

New view of the seas

Scripps scientists are turning their sights upward to the stars for an unprecedented perspective on their world of the sea.

Working in cooperation with a variety of other institutions and government agencies, including NASA and Pasadena's Jet Propulsion Laboratory, Scripps is involved in a project utilizing an ocean-survey satellite called SEASAT-A. The satellite, launched on June 26, will circle the earth 14 times daily covering 95 percent of the global ocean area every 36 hours, sending back to earth information on surface winds and temperatures, currents, wave heights, ice conditions, ocean topography and coastal storm activity.

The SEASAT-A is the first satellite to be launched for the expressed purpose of studying the seas.

Two Scripps scientists, Robert L. Bernstein and Robert H. Stewart, both remote-sensing specialists, are working on the project. Scripps Director William A. Nierenberg, senior consultant to the White House Office of Science and Technology Policy, has recently been named chairman of the newly formed NASA Advisory Council.

"It is perilous to predict history," Nierenberg stated, "but SEASAT-A can have the same impact on oceanography that the *HMS Challenger* (the first oceanographic research vessel) had some 100 years ago. The principles of oceanographic research are substantially unchanged since then. Our great, advanced technology has, of course, improved the procedures, but they still are shipboard-limited."

Merle Wilson (11/6/78)

Excerpts from recent NEKTON news releases:

"NEKTON GAMMA has completed a series of dives for the National Marine Fisheries Service/NOAA in Alaska. The contract called for a program of data gathering including observation and photography of bentho biology with the emphasis on fish and crab activities, and the observation of various equipment used to harvest these denizens of the deep. In the process of 62 dives in 20 operating days, NEKTON GAMMA took over 9,000 photographs, ran over 5 miles of traplines, and observed numerous fish and crab traps in situ. Observations were also made regarding water temperature, current velocities, and water turbidity."

"A new high-energy battery system has been tested successfully in NEKTON GAMMA, providing power to the main drive motor and incorporating a number of innovative design features, including a truly sealed design, with high energy density and high charge rate capabilities. Because more electrical energy is stored in a unit of space than in conventional batteries, operating time between recharges is increased. Additionally, a fully discharged battery pack in a submarine may be recharged in a little over one-half hour, making possible a substantial increase in effective working time each day. The battery, a new prodict developed by the Gates Energy Products Company, a division of Gates Rubber, utilizes the starved electrolyte process. Oxygen evolved at the positive electrode in the cell during over-charging is recombined at the negative electrode within the battery. While the battery itself is not experimental, its use in submersibles of this type is unprecedented."

"General Oceanographics' 90' LOA Submersible Support Vessel SEAHAVEN, now under construction at V.A.P. Shipyard in Amelia, Louisiana, will be launched in 1978. The craft incorporates several innovative design features, foremost of which is a dynamic launch/recovery system wherein a floating submersible positioning target is utilized to guide the sub into position over the nesting cradle on the elevator. The elevator lifts the mini-sub to deck level rapidly, minimizing the motion differential between sea surface and ship motion, the major problem encountered in recovery systems. It is expected that this system will extend the operation's weather window to sea state 4. The primary area of anticipated operation is the Gulf of Mexico, where the system will be used in support of the petroleum industry. The ship will have a cruising radius of 2000 miles and is designed to remain at sea up to 30 days at a time."

"General Oceanographics has been notified by Intersea Electronics of Santa Ana, Californis, of the latter's successful bid for a Bureau of Land Management environmental study of Tanner-Cortes Banks, about 100 miles offshore from San Diego. The contract calls for high-resolution geological and biological mapping and photography of selected sites. General Oceanographics will be a subcontractor and will conduct in situ observations of benthic communities, utilizing the two-man submarine NEKTON GAMMA. The sub will run transect lines based on preliminary bathymetry and sidescan sonar observations. The NEKTON submersibles will find familiar diving during the course of this contract, since the company has done submarine and seismic profiling extensively in the Tanner-Cortes Banks area.

NEKTON

21 September 1978

John Pritzloff
c/o Westinghouse Oceanics
P. O. Box 1488
Annapolis, MD 21404

Dear John:

I am writing this letter to you because of the controversy that has arisen regarding the two-wire, as opposed to the single-wire, electrical system in the *Nekton* submersibles. As you know, we discussed this in London, although briefly (and you will recall my chagrin at the result), but I don't think the matter has ended, at least it should not be.

As you may or may not know, Doug Privitt is currently building another *Nekton*-type submersible and has essentially sold us the boat at this time. Of course the sale is contingent on the boat being ABS certified. A call from Doug only today has me somewhat on the edge of my chair because he reports the ABS people now are requiring a double-wire electrical system, as a result of our meeting, with John Ryder in attendance.

Again I would like to question, as I have many times in the past, whether we were making safety "guidelines" or rules. According to the ABS Handbook of Guidelines of 1968, Section 6.6.1 *Ungrounded Systems "...power distribution systems should be ungrounded to minimize the occurrence of faults and stray currents which may create galvanic corrosion."*

I have offered in the past (and that offer still stands) the access of all *Nekton* submersibles to any interested party to check these hulls for the presence or absence of galvanic corrosion. Only as recently as 10 July 1978, ABS Inspector V.E. Julianel, Jr. attended the *Nekton Gamma*, I.D. #7120190, for the purpose of certification, and in his report No. SC484 there is no mention of corrosion, galvanic or otherwise. This sub had just undergone refit, including sandblasting and finish coat. Report No. SC455 for *Nekton Beta*, I.D. #7020077, conducted 25 April 1978 by the same surveyor mentions in Item 1, *"The internal and external surfaces of the pressure hull including all penetrators, hatch, coaming, latching devices, lifting lugs, windows and gaskets were examined*

Nekton Seismic Surveys   Nekton Submersibles   Nekton Electronics   Nekton Marine Geology
11578 Sorrento Valley Road • San Diego, California 92121 • 714/452-9540

to me professionally. I do not operate unsafely, nor do I operate inferior equipment. Our records will show that the *Nekton* submersibles have operated longer and made more dives than any other commercial submersible venture in the United States, and I resent this inference by the Committee.

While we were in London, I noticed the vehicles travelling on the "wrong side of the street" (by U.S. standards). I suppose an Englishman in the United States would find us driving on the wrong side of the street. In both cases, the system works and it would be impossible to say one of them is wrong.

I understand builders of high-speed aircraft (I am not an expert on this sort of thing) frequently use titanium. That used in low-speed aircraft is aluminum and fabric. It would be folly to build super-sonic aircraft with some alloys of aluminum and fabric. It would be equal folly in my opinion to build low-speed private aircraft out of titanium. These are two applications using different materials to achieve similar end results.

I am in complete concurrence with the two-wire system in submersibles using electrical systems exceeding 50 volts. If anyone can show the *Nektons* unsafe, or give me reasons that prove beyond the shadow of a doubt, the detrimental engineering aspects consistent with a safety point of view of *Nekton* submersibles, he has yet to step forward, and I solicit from you and the Committee that expert.

John, I think these so-called guidelines that you and I agreed to initially are now threatening my commercial activity to some extent. Should ABS decide to take the bit in their teeth, they could, I assume, withdraw my ABS certification. This would mean that I would no longer be eligible to bid on government contracts.

It is possible that the insurance underwriters could view this as a reason to either increase my rates or refuse to insure these submersibles. I base this last statement on the fact that Francis Bruen of Lloyds called me regarding my request for Lloyds' rates and asked during the course of the conversation if I had in fact switched over to a two-wire system. Is this why General Oceanographics and myself committed the time and effort on our part to the Safety Committee? Most opinions regarding the seaworthiness of the *S.S. Titanic*, including "expert opinions" were overwhelmingly positive. Most opinions regarding the probable success of Charles Lindburg in his solo flight across the Atlantic, including "expert opinions" was overwhelmingly negative. In both cases the popular opinions were proven wrong. Let's not rule by popular vote -- just facts.

and found in satisfactory condition." This sub had not undergone sandblasting and finish coat.

These inspections were part of a special periodic survey, and Items 1-6 in this report are annual survey items credited to that special periodic survey. The special periodic surveys included more stringent requirements than the annual inspection, including a dive with the ABS observer to the rated depth of 1,000 feet.

Nekton Gamma has in excess of 566 dives, *Beta* has in excess of 789 dives (not counting numerous shallow test dives), and I reiterate--there is no sign of galvanic corrosion that I can detect.

The second area of question mentioned in a phone call by Ryder to Privitt, i.e., the electrical hazards involved in this type of system, apparently was a result of my heated argument in London with Busby, Shumaker, and J. Howland, since the question is not raised in ABS Guidelines or elsewhere that I know of. In my opinion, there are no undue hazards from an electrical point of view with this system because we have never evidenced any shocks to any of the personnel riding in the boats, and I have personally changed fuses while in the boat, seated in the pilot's seat, reaching behind the panel and fondling the nuts on both sides with my bare hand. I remind you I had a heart attack in 1969. I surely would not have done this in a *Pisces*-type sub. Kookcum's sub reportedly will have a 440 volt, 3-phase electrical system -- is that safe?

As for the reliability of a double-wire system -- I would remind you, John, that any double-wire system must by definition have two wires going through the penetrator to the ultimate load on the exterior of the vessel, and it would seem to me that this doubles the chances of a fault rather than increasing the safety of the vessel.

As you know, John,I was somewhat upset in London with these people, not because they can do much to me because my boats are certified ABS , but principally because I felt, and still feel, that the object of these discussions was for safety reasons. I do not feel that safety is compromised or reliability is enhanced with these changes, and feel strongly that they should remain recommendations -- not rules.

I am being asked in effect to double the number of penetrators in my pressure hull (or cut half my availability of electrical usage externally). If I double the number of penetrators through the pressure hull, does this increase my safety?

This whole matter has the appearance of an accusation of unsafe operations using technically poor equipment, and that is an insult

I am open to future discussion and will meet with responsible people wherever and whenever you suggest.

I shall be sending a copy of this letter to Frank Busby and John Ryder, and have no objection to the dissemination of the contents to anyone you feel is an interested party.

Regards,

Merle D. Wilson
Vice President Submersible Operations

MDW:cjw

cc: Frank Busby
Douglas Privitt
John Ryder

NEWS RELEASE

6 November 1978

General Oceanographics, Inc., 11578 Sorrento Valley Road, San Diego, announced today that the company, which was founded in 1955, is changing its name to NEKTON, INC. Company President, Carroll Hoyt, stated, "the change is being made to simplify pronounciation and improve recognition of the company name and to reflect diversification into activities other than oceanography." NEKTON, INC. performs high resolution geophysical surveys, maps seafloor geology, and prepares interpretive reports. The company is presently undertaking the manufacture and marketing of two newly developed microprocessor control units for seismic recording systems. The firm, which has approximately 40 employees, owns and operates two surface vessels and three small submarines.

1978

MARFAB

1428 E. BORCHARD
SANTA ANA, CALIFORNIA 92705
(714) 541-5035

RECEIVED
SEP 22 1978
General Oceanographics, Inc.

21 September 1978

John Pritzloff
Chairman MTS Safety Standards Project
Annapolis, Maryland

Dear Sir:

I have, for the past eighteen months, been engaged in the construction of a NEKTON type submersible. Recently I contacted the American Bureau of Shipping in order to initiate certification procedures. After numerous and protracted telephone conversations I received a letter dated September 12, 1978 indicating that certification may be denied on grounds that the electrical system does not comply with the standards.

(Section 6.6.1 With regard to the electrical system being grounded with some of the equipment using the hull as an electrical conductor, we must advise that the structure is not to be used as a current carrying conductor. Additionally, power distribution systems are to be ungrounded to minimize the occurrence of faults and stray currents which may create galvanic corrosion.)

This type of submersible is unique and I am aware that a grounded system is certainly not recommended for all types of submersibles.

I have used this electrical system for twenty years on several different vehicles without adverse consequences. There are presently two A.B.S. classed submersibles (NEKTON Beta and Gamma) that utilize my system and it is my considered opinion that this system is sound and safe.

I feel that this decision is unfair because it is based on insufficient knowledge of a unique vessel and it ignores a precedent. (The NEKTON vessels)

(Douglas N. Privitt)

Westinghouse Electric Corporation Industry & Defense

Oceanic Division

Box 1488
Annapolis Maryland 21404

RECEI
OCT 3 1978
General Oceanographics, I

28 September 1978

Mr. Merle Wilson
GENERAL OCEANOGRAPHICS, INC.
11478 Sorrento Valley Road
San Diego, CA 92121

Dear Merle:

I have received your letter of 21 September and one from Doug Privitt of the same date. I realize there is a problem. However, I do not think that the latest MTS work on "Safety Standard Guidelines" has created the problem. In the equipment section, A.d.1.3, it lists as an essential piece of gear an Electrical Fault Detector-Instrument capable of detecting closed or open circuit faults. I think you already have fuses and meters that meet both open and closed circuit fault detection needs.

Currently MTS has said nothing about the type of circuits involved, i.e, one or two wire - grounded or ungrounded. If that is a problem, now it should be looked at in light of what is the problem and how can you address it.

I think you have ABS classification on some or all of your one wire, grounded Nekton systems. How this came about doesn't really matter. If ABS wants two wire ungrounded systems now, that's what you need. Or show some documentation that your one wire system is o.k. and go for a waiver. I seem to recall that you have a 48 volt DC system. Is there any medical documentation that 48 DC is non'lethal? Do you have inspection data to show that it doesn't increase galvanic corrosion?

Most all of the classification societies look to the two wire ungrounded systems as being generally safer. If you have a one-wire safe system, show that it is-on paper-so that ABS has something to put in their files. To say that you have had no problems to date on xxx number of dives is not good enough as you may have just been lucky so far. However, if 48 volts is safe - and documented, i.e., human skin resistance prevents a non-fatal current flow or something like that. And, if your system design, materials and paint prevents excessive galvanic corrosion you may be able to get a waiver on the new boat.

Good luck,

John

J. A. Pritzlaff, Chairman
MTS U/S Vehicle
Safety Standards Subcommittee

cc: MARFAB
American Bureau of Shipping
Frank Busby

/t

ECEIV
OCT 3 1978
Oceanographics, I

Ocean Systems, Inc. Buys Three Remote-Controlled Underwater Submersibles

Ocean Systems, Inc., 1441 Park 10 Boulevard, Houston, Texas 77084, has purchased three new remote-controlled underwater submersibles for service operations in water depths up to 1,000 meters. The three units are a part of a long-term purchase agreement with International Submarine Engineers of Vancouver.

Two of the new units are TROV systems. They are 1,000-meter work vehicles, which have two manipulators and carry TV, photographic and underwater survey equipment. The third unit is a TREC system, which is a single-manipulator work vehicle used primarily for underwater plat form and pipeline inspection in water depths up to 400 meters.

With the acquisition of the three new submersibles, Ocean Systems will have five complete systems in the field, two of which are under contract. The company has established a complete TROV/TREC operations and training center at their Houston headquarters.

Ocean Systems, Inc. is an Enserch, Inc. company specializing in underwater survey and inspection service for the worldwide oil and gas industry.

LORAN-C Switch Poses Economic Problems for Users

Financial and informational problems face boat operators, mainly fishermen, who are being forced to switch from LORAN-A to LORAN-C navigation systems.

According to a study completed by the Sea Grant Program of Oregon State University and sponsored by the U.S. Coast Guard more than 50,000 U.S. navigators rely on LORAN.

It was discovered that timing of the LORAN-A cutoff dates imposed a financial burden just as season activities were peaking. As it stands, the west coast cutoff was set for July 1, 1979, while the east coast date was July 1, 1980.

Acting on the study recommendations the Coast Guard has delayed the termination dates by six months in each instance. Thus the cutoffs will fall in the late fall, or winter months when activities ebb and will have less impact on users.

NOV 78

Perry Oceanographics Designs And Builds New Undersea Work System

Perry Oceanographics, Inc., P.O. Box 10297, Riviera Beach, Fla. 33404, under contract to Seaforth Maritime Limited, Aberdeen, Scotland, has started the design and construction of a new concept in undersea observation, maintenance, and repair vehicle. This vehicle, a Mobile Diving Unit (MDU), is a major component of a 16-man diving complex being built by Seaforth Maritime for Occidental Petroleum (Caledonia) Ltd. Scheduled for delivery in early 1979, the system will be used aboard Occidental's semisubmersible multifunction support vessel (MSV). Diving consultants for the project are John Haynie, Inc.

The vessel will be used for deepwater maintenance tasks at the Piper and Claymore production platforms and associated pipelines in the northern North Sea.

The Perry MDU, based on both diver lockout submarine and conventional diving chamber technology, will give the divers horizontal mobility, nearly unlimited electrical and hydraulic power at the work site, and a full at-site, surface-monitored instrumentation capability.

The MDU is an 18-ton, 1,000-foot depth vehicle capable of maneuvering in any direction. It consists of a one-atmosphere observation chamber (AOC) and three-man submersible decompression chamber (SDC). Mounted above the SDC, the AOC affords an excellent view of the work site through a 31-inch panoramic window. The AOC contains controls, navigation, sonar, and communications systems. It also acts as the operating station for a manipulator and hydraulic tool package. The SDC is fully fitted for three divers equipped for North Sea diving. The compartments are connected by a hatch that may be opened to provide an expanded one-atmosphere work space during extended observation missions.

The MDU also has television, welding, water jet, and nondestructive testing capabilities, and is designed for dry transfer to underwater welding habitats.

LARGE OBJECT SALVAGE SYSTEM DEVELOPED

Remote recovery of large submerged objects from depths to 850 feet will become possible due to efforts of scientists and engineers at the Naval Coastal Systems Center (NCSC), Panama City, FL.

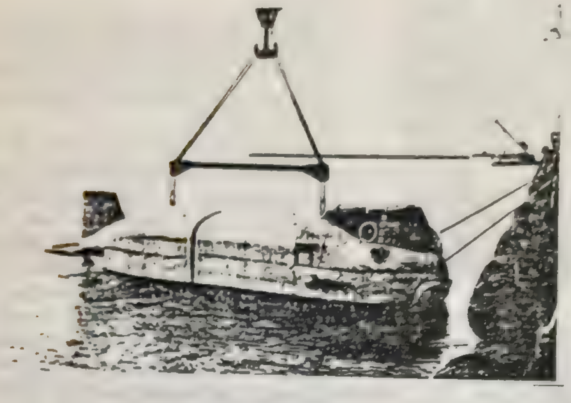
Seven years of development were culminated recently when NCSC conducted a successful demonstration of the Large Object Salvage System (LOSS) in the Gulf of Mexico.

The system is composed of a remotely controlled delivery vehicle which descends in the water to position rigid pontoons on the object to be recovered. Lift is accomplished by remotely displacing the water in the pontoons with nitrogen gas.

Objects which could be recovered using LOSS techniques include submarines and submersibles, surface ships, missiles, and airplanes.

NOV.

Kockums Launches Sub



The URV rescue submarine, designed to rescue the crews of submarines in distress, will replace the Swedish Navy's present system of rescue bells.

After delivery later in 1978, the URV will be stored on a trailer at the Navy's diving center outside Stockholm. When a distress signal is received, the URV can be quickly transported by road and sea to the distress area.

The URV uses acoustical signals from the sub as well as its own to home in on the disabled submarine. The URV is then connected to the submarine by an escape hatch through which it can take on up to twenty-five of the crew of the disabled vessel.

The URV has a displacement of 50 tons. It is 44 feet long, 14 feet wide and has a maximum diving depth of 1,510 feet.

For Kockums, the URV represents the yard's entry into the field of civilian undersea technology. Experience acquired during construction of the URV has been applied to developing other submersibles for the use in the offshore industry.

We received some really fine covers, plus a letter, from the Canadian SDL-1 this month. The covers were for dives #371, 372, 373, 376, and 377. All dives were made in the Bedford Basin and depths ranged from 55' to 250'. Pilots were Martin, Sherlock, McLeod, and Hobson.

The cover for dive #377 is most interesting as it is documented for joint operations with the MANTIS one-man submersible.

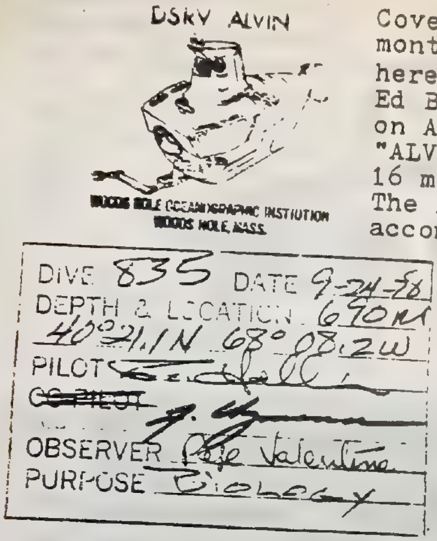
The letter is from Lt. B.A. Hobson, one of the pilots of the SDL-1. He writes first of all that we should note a change of address....send your 2 covers now to....HMCS CORMORANT, FMO, HALIFAX, B3K 2X0, Attn: Chief Operator - SDL-1.

The CORMORANT is Canada's newest Naval ship and the SDL-1 is now under her direction. Lt. Hobson said that he was including an article on the CORMORANT, but he forgot. I would still like to have it if it has not gotten lost in the shuffle.

The crew of the SDL-1 is composed of...Detachment Commander - LCDR. Bruce Martin; Pilots - Lt (N) Brent Hobson and Lt (USN) Silas Thorne, American Exchange Officer; Crew Chief - MWO Dan McLeod (replacing Ivan Sherlock); Copilots - PO Sam Semple and PO Joe Paquin.

Lt. Hobson writes that dive #377 was made in the Eastern Passage to conduct trials with the OSEL MANTIS, which was fresh off the drawing board. He says it was a very interesting series of dives.

the mid-Atlantic Ridge trip coming up is a continuation of the last one in 1975 -- Project FAMOUS. It will be more study of the continental spreading theory which has included, in addition to FAMOUS, the Galapagos trip and the two Cayman Trough cruises. With ALVIN's new 4000 meter certification she'll be doing deeper work on the Ridge this time. Incidentally, Ed notes that dive #801, which was documented for us, was the Navy Certification dive and first dive to her new depth capacity of 4000 meters. ALVIN now has the distinction of being the deepest certified submarine, with the exception of TRIESTE and ARCHIMEDE. (There is a continuing controversy about whether TRIESTE and ARCHIMEDE are true submarines.


DSRV ALVIN

WOODS HOLE OCEANOGRAPHIC INSTITUTION
WOODS HOLE, MASS.

DIVE 835 DATE 9-24-78
DEPTH & LOCATION 690 M
40°21.1N 68°08.2W
PILOT
~~CO-PILOT~~
OBSERVER Page Valentine
PURPOSE Biology

Covers reported, and received, from the ALVIN this month are for dives #835, 836, and 838. None received here for dive #835 reproduced at the left. Ed Bland wrote a fine letter to bring us up to date on ALVIN plans and I will quote it for you: "ALVIN/LULU will be gone from Woods Hole for about 16 months when they leave next Friday, Oct. 20th. The AMAR 78 cruise was very successful - all goals accomplished and no particular problems with either ship. On the way back across the Atlantic they did tangle with the tail end of the hurricane and effectively made no forward progress for a couple of days, but no real damage was sustained and Bermuda was made only one day late. A couple of dives were made on the permanent bottom stations south of Nantucket on the way back to Woods Hole (833 and 834 - your assumption was correct). Since arrival at Woods Hole we have been in an upkeep and get-ready-for-the-next-trip status. ALVIN has been taken apart for minor repair and inspection and has had a second manipulator installed. LULU also had minor repairs and paint and loading for the long trip.

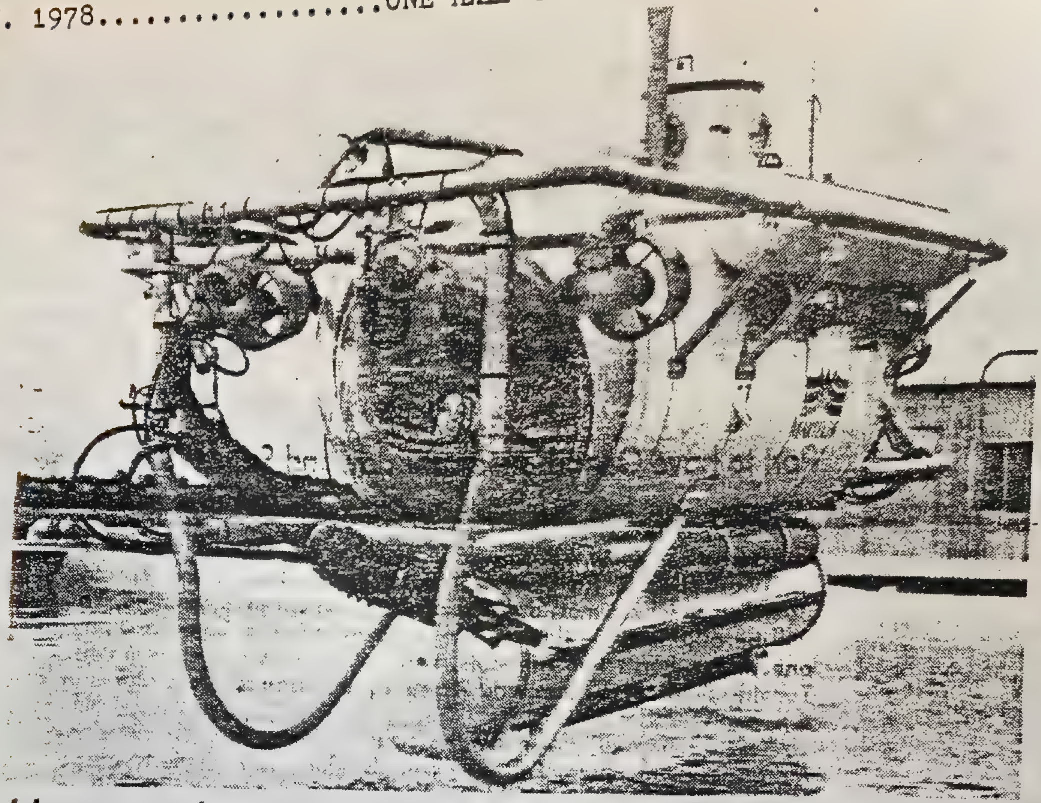
First leg will commence on Friday the 20th with a stop east of Charleston for one dive on the plateau then on to Freeport to pick up scientists. About five weeks of diving in the Bahamas then to Puerto Rico for a couple weeks operations there. Christmas stand-down in Roosevelt Roads. Transit to Panama commences on Jan. 2nd followed by a number of dives in the Galapagos. Will probaly port in Manta, Ecuador between Galapagos legs. From Ecuador north stopping in Costa Rica and Mexico. Dives in the East Pacific Rise off of Mexico then north to San Diego and San Francisco.

A two-man submarine was found in the home of a Miami man. He has been charged with transporting explosives and having intentions of destroying whaling ships in South America. The photo in the newspaper looked like it might be a wet-sub; one of the Perry SHARK HUNTERS or REEF HUNTERS.

Mr. John F. Manuel, Vice President Marketing of Perry Oceanographics, writes that the wet sub I mentioned on pg. 61 of the Aug. issue was not one of the Perry subs.

Mr. Manuel goes on to write, "Our RECON III's are active in the North Sea and should be commencing operations in the Gulf soon. Our RECON V will be in the water for trials toward the end of Aug. We have recently completed a 650' depth dive system for Trinidad Ocean-Land Services, Ltd., and on the "more exotic" side have a major project, the $1 million MOBILE DIVING UNIT (MDU) under construction as part of a subcontract with our Scottish joint venture, who is producing the U.K. built balance of the diving system for the Occidental of Britain semi-submersible multi-purpose support vessel.

Also under construction is our 3000' second ARMS II bell for Oceaneering for January delivery. Pete Nellessen, program manager for the first bell was happy this week to learn that the first bell was operating successfully at 3000' from the BEN OCEAN LANCER, a beautiful new drillship operating off Halifax, N.S."



Houston-built sub

Martech International Inc. of Houston has completed the first submergence and systems operational tests on its newest submersible, Pioneer I. The two-man unit, built here, is designed for a variety of undersea work, survey and observation missions at water depths up to 1,200 feet. The craft was designed by Mike Witt, the company's technical and engineering manager. The next phase of its testing will be carried out in 1,200-foot deep water. Martech said the Pioneer I is expected to be in commercial service by the middle of next month.

GLOBULE

COMEX SERVICES

Avenue de la Soude
B.P 143
13275 Marseille Cedex 2
Phone (91) 41.01.70
Telex 410985 F

CHARACTERISTICS

Overall dimensions :
Length 3.20 m
Width 2.00 m
Height 2.50 m

Viewports (6) : 510 mm I.D.

Displacement : 4 metric tons

Operating time on umbilical : over 8 hrs
on batteries : 2.5 hrs

Emergency life support : 96 hours

Propulsion : 2 horizontal, 2 vertical and 1 transversal thrusters

Safety

In emergency the sub can jettison :
- the battery pods
- a 180-lb. ballast weight

It is equipped with :
- radio beacon
- pinger
- 2 Fenzy breathers
- fire extinguisher
- food and water for 4 days.

Standard equipment

Gyro compass
Underwater telephone
Tracking sonar
Depth gauge
VHF multi - channel transceiver
Echo sounder bottom/surface
Video camera and recorder

The GLOBULE III is a new 2-man submersible designed and built by COMEX Industries. Depth capacity is 1,000' and missions of up to 4 hours are possible.

Swedish Government May Permit Kockums To Sell Subs Abroad

A "positive response" has been received by the shipbuilding company, Swedish Kockums Varv AB, from the government to sell a model of a civilian submarine abroad — the Type 45, according to **Sven Rahmberg,** manager of Kockums Naval Division.

"Kockums has placed offers for submarines in a foreign country, and to sell to that country it is necessary to have a license from the government. The government response has been good, so I think Kockums will get the license," Mr. **Rahmberg** said from Kockums Malmo headquarters.

He would not reveal with which country Kockums placed the offers, but he said that the contract would amount to about 500 million Swedish kroner (4.46 Swedish kroner equals one U.S. dollar), and would mean employment for some 200 persons over a five-year period.

He also would not confirm the exact number of subs involved, but indicated that the contract would call for the sale of between two and three vessels.

Kockums Launches Two More Submarines

Kockums Shipyards, Malmö, Sweden, recently launched two submarines, one an attack sub and the other a rescue vehicle. The attack submarine *Nacken*, 49.4 meters long, is the first of three such subs to be delivered to the Royal Swedish Navy between now and 1979.

Nacken carries a crew of only 19 persons, small by international standards. This is enabled by the inclusion of a central computer which handles command and fire control, engine control and routine supervision. Her displacement is 1,030 tons, and her armament consists basically of wire-guided attack torpedoes against surface targets and target-seeking torpedoes for attacking other submarines.

The rescue submarine, called URV, will replace the Swedish Navy's present system of bells to rescue downed submarines. Having displacement of 50 tons, it is 13.4 meters long and can rescue up to 25 occupants of a submarine in distress, which it boards by mating with it through an escape hatch. Its maximum dive depth is 460 meters.

Optical Viewing System

An advanced optical viewing system which may offer improved seafloor search and mapping capability recently concluded successful in-ocean tests. The Real Time Optical Mapping System (ROMS) gave high optical resolution covering a large swath width, providing readout showing real time optical pictures of the seafloor.

Developed by the Naval Ocean Systems Center, San Diego, ROMS reduces detrimental backscatter effects through use of the volume scanning principle. The system consists of a flying spot scanner in an underwater transparent acrylic housing.

Light source is an argon ion laser, mechanically scanned to illuminate a 120-degree fan beam. The system provides real time seafloor optical pictures from a 37-meter (120-foot) height with a 122-meter (400-foot) swath width.

ROMS depends on a set of rotating, three-faceted mirrors mounted on a single shaft. The first mirror sweeps the laser beam across a 120-degree angle. The second mirror, synchronized with the first, receives a portion of the beam reflected from the seafloor and reflects it through a focusing system to a photomultiplier.

Before transmission to the surface, the photomultiplier signal is preamplified and processed. At the surface the signal is processed again for compatability with the cathode ray tube display.

- **Bruker Meerestechnik GMBH,** a daughter company of **Bruker Physik AG** (producer of sophisticated electronics instrumentation), which has headquarters in Karlsruhe/W. Germany and affiliates in Switzerland, France, and USA. Submersible development and construction began 10 years ago as a separate department and is now growing fast for the offshore business. Three MERMAID subs are presently in operation: the 2-man inspection sub MERMAID II, sold to IUC in 1974; and the two-man inspection diverlock subs MERMAID III and IV, delivered to P & O Subsea (U.K.) in 1975 and 1976 respectively. The latter subs are very active in all kinds of North Sea offshore jobs. Presently two larger MERMAID VI subs (600 m diving depth, exchangeable diverlockout/rescue dome) are being built on contract. Furthermore, Bruker has government support for developing and building an exciting new vessel, the "SUBCAT", a 400-ton submersible catamaran designed for multiple use as a diving base/welding habitat/pipeline laying base, etc. Completion of the first SUBCAT should take place in about two years.

"Shelf" Probes Shelf

The bathyscaph *Shelf*, built at the university in Vladivostok, a Far Eastern port on the Pacific Ocean, can remain submerged at a depth of 500 meters for 36 hours. Weighing slightly over three tons and capable of accommodating a crew of two, the apparatus can easily be transported to any district or site. The purpose of the bathyscaph is to study the coastal shelf. Its testing completed, *Shelf* has been put into operation.

Bruker Shipyard in West Germany has two rescue subs under construction. They are designated MERMAID VIA and MERMAID VIB. They will carry 2 pilots and 3 divers and are designed for rescue, salvage, and research. Depth capacity is 2,000'.

HOMEMADE SUBMARINE

Teen-Agers' Spirits Rise as Their Invention Sinks

BY KAREN DINDER
Times Staff Writer

VISTA — Marshall Simmons and Jay Welch, both 18, can at least be glad their first invention wasn't all wet.

The two recent high school graduates capped a year of effort this week when they launched their 9-foot-long homemade submarine in Oceanside Harbor.

"We weren't really expecting it to float after weighing it and finding out it was 200 pounds over our estimated 1,500 pounds," Simmons said Friday. "But it floated perfectly."

Well . . . almost perfectly. "It did leak quite a bit," Simmons conceded, "but Jay and I will fix that problem next week."

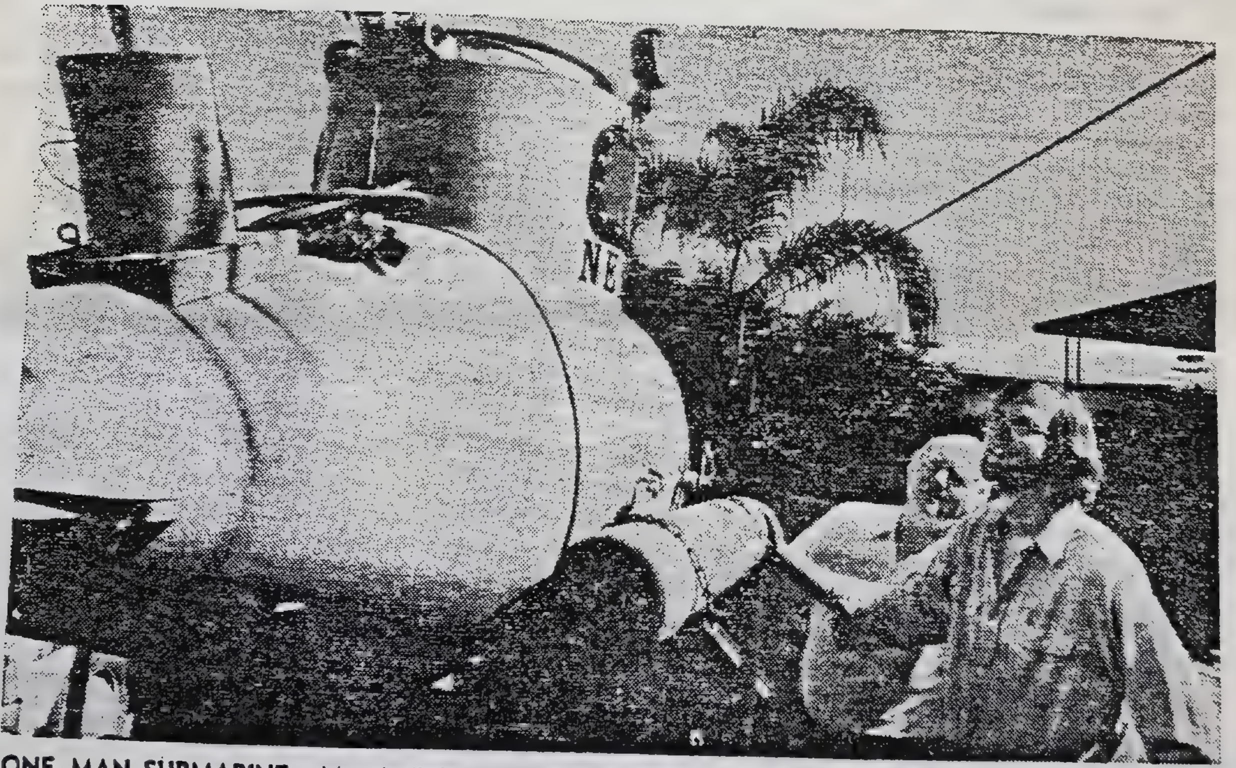
The submarine — christened the "Nemo" — got its start 18 months ago when Simmons bought a book entitled "Manned Submersibles." It took him three readings, he said, to understand the 800-page tome.

But, once he did, he and Welch worked evenings and weekends for more than a year to construct the craft in a Vista sheet-metal shop belonging to Simmon's father, Troy.

The body of the submarine is of 16-gauge galvanized steel reinforced with angle and band iron, materials Simmons' dad provided. The one-person craft is battery operated. The motor is to be installed soon.

Two ballast tanks are used for submersion. Flaps in the tanks open to let the water in. The compressed air tanks at each end of the craft force the water out, thereby letting the craft surface.

"We have a pretty good safety system in case of emergencies," Simmons said. "We have a flood valve to flood the sub and then escape through the hatch. Or we could release a 600-pound concrete block fastened to the bottom for weight purposes."



ONE-MAN SUBMARINE—Marshall Simmons, 18, shows father, Troy, the craft he and friend built.

For Two Buddies, an Old Fantasy Sank With Submarine

By CATHERINE HEALY
Herald Examiner Staff Writer

It had been a long, preparation at the foggy Aquatic Marina near Seal Beach yesterday morning. Mike Smith of Pasadena and a scuba diving friend, Ken Sanders, had tightened bolts and readjusted screws on Mike's 12-foot sub for nearly two hours before launching.

As Sanders guided his 28-foot cabin cruiser, the "Sea Trek", out toward the wreck of the old gambling boat "Olympic" about 7½ miles away, with the little submarine in tow, the two men relaxed.

"Well, she's not wallowing like a walrus this time," observed Sanders. "Looks like it worked to tie the rudder."

Smith sat with his back to Sanders, proudly watching the shiny orange, torpedo-shaped sub stir its own wake behind the Sea Trek.

Suddenly he moaned, "Holy God! She's down."

Down with the sub went dreams.

Last September, the radiologist indulged a 13-year fantasy and bought his own submarine. Smith spent most of the winter and spring tinkering with his $12,000 toy, finding ways to improve it. He and Sanders, an electronics engineer, designed an electrical system. The bolt on the hatch leaked slightly one of the few times Smith and Sanders took the sub out, so the two of them devised an additional protection of three sea clamps.

Herald Examiner Photo by Catherine Healy

Ken Sanders greeted the Harbor Patrol on minisubmarine hours before it sank.

Smith loved his plaything so much that he dreamed up all sorts of rationalizations to justify owning it. The best had just happened. A marine biologist contacted him. He needed Smith's help extending his underwater research beyond the limits of scuba diving.

And the adventures, oh the adventures Smith imagined.

He was going to take his 2,500-pound baby to Lake Tahoe this week. And there, in some of the clearest water in the world. Smith was going to practice with the sonar equipment he had installed.

The idea was to spot an object, train the sonar on it, and then learn to hear how the sonar described what he was seeing.

Once Smith had the sound knowledge down, then he would be ready to see the underwater world, beginning with three weeks in Baja looking for shipwrecks with 16 diving buddies.

But now his sub was the wrecked ship.

"I'm going down," Smith said grimly to Sanders, John Marshall and a Herald Examiner reporter, as he struggled into his wetsuit.

Gene Baskevitch, a fellow diver, had been following close in another boat

"Get the Coast Guard!" Sanders yelled. Baskevitch couldn't hear. He pulled closer. Shouted the message and without pause, Baskevitch opened his throttle and turned back to the marina

All that could be seen of Smith were occasional bubbles. Finally he surfaced, clung to the side of the boat and took his mouthpiece out.

The sub sank because of a mistake, he sighed. A dumb mistake. An oversight. His voice was as dead as his dreams. He had no insurance on the sub.

What happened, he continued, was that when they clamped the special sea latches on the hatch, he had forgotten to clamp the bolt too. The force of the sea water had torn the clamps away, the hatch opened and the sub flooded.

The rear of the vessel was resting on the ocean floor, about 30 to 35 feet down, Smith added, and dove again. This time he took an extra tank of compressed air. He hoped to blow out enough water from the front of the sub to lift her.

A geyser of bubbles foamed to the surface, but the minisub stayed grounded.

Several attempts to blow compressed air into the submarine, which was lying 35 feet down, failed to raise the vessel.

Then an orange marker balloon to show the location of the sunken sub broke loose and floated away.

The submarine was lost.

But Smith, who owns one of 29 minisubmarines developed by inventor George Kittredge, wasn't giving up.

Color had returned to the physician's face by the time he got back to the marina. He had a rescue plan

Tahoe was obviously out, but Smith still had the week vacation. He knew a company in Los Angeles with a particularly sensitive tracking device. He could locate the remains, have them raised to the surface and towed ashore.

The electronics equipment was ruined — There was not hope there — but the body of the sub would be okay if he hurried.

And if the sub wasn't repaired in time for Baja, there was always the dream of the Philippines where the seashells are the finest in the world.

HORTON MARITIME
EXPLORATIONS
AUGUSTE PICCARD

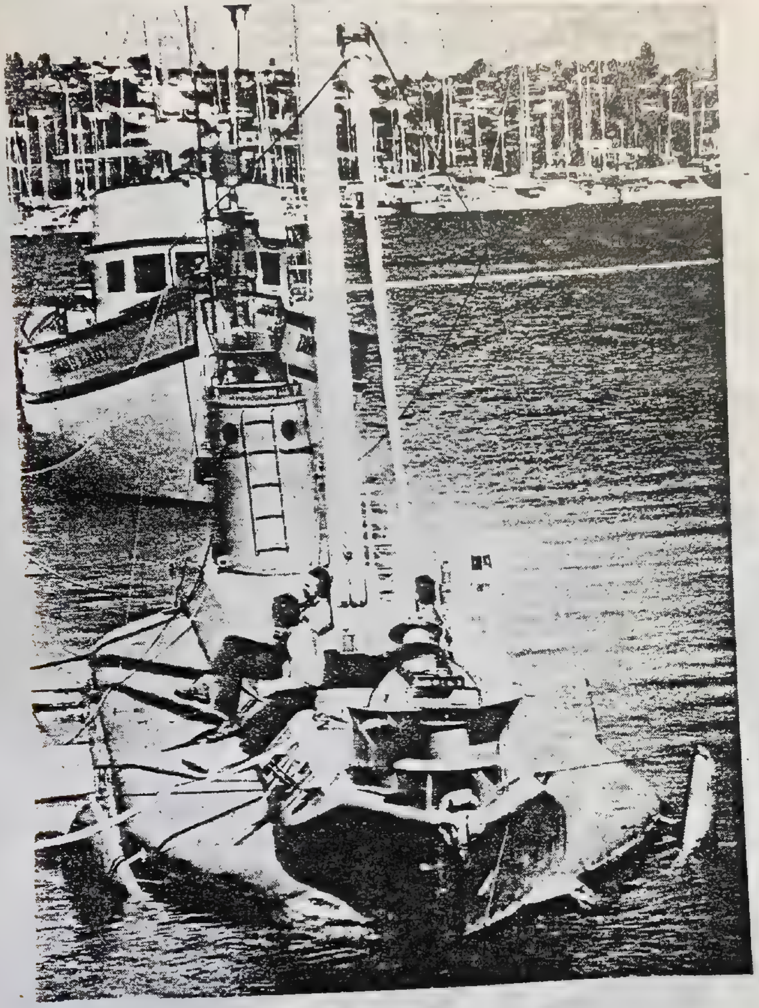
For further information, please contact:

Horton Maritime Explorations
1174 Welch Street
North Vancouver, British Columbia
Canada V7P 1B2

Tel: (604) 980-8591

PRINTED IN CANADA

Slow Sub To Set Sail For The Gulf



A sleek-looking, slow boat headed in the opposite direction from China is moored near the U.S. Coast Guard station at the west end of Shelter Island.

It is a 93-foot submarine with a 30-foot mast and a six-man crew who will whip out a sail and attach it to the mast, when the sub surfaces, to pick up more speed.

The boat's name: Auguste Piccard.

Under full sail, the craft will add 40 percent to its cruising speed, whizzing along at 7 knots instead of 5. The sail was deployed part time on the submarine's cruise here from San Francisco and it still was a week-long trip.

"It was boring," confessed Trevor McLeod, an electronics technician from Vancouver making his first run on the strange vessel. He was standing guard duty yesterday, a few hours after arrival, with the remainder of ship's personnel ashore.

Because her speed is slow and waves break over her catwalk in rough seas, her upper section is painted with safety colors: International orange and white. Horton Maritime Explorations, the owner's name, is emblazoned on one side. She was not originally meant for high seas.

The ship was built in Switzerland for the Swiss National Exhibition of 1965-66 and was operated for thrillseekers.

The last two years have been spent largely in getting her shipshape for ocean exploration. Her first big assignment is to determine whether certain sections of the Gulf of Mexico have silt or solid ocean bottom.

Under lease to Gulf Maritime, the ship will provide information to be used in decision-making relating to oil-drilling rig locations.

The submarine is expected to remain here at least 10 days for repairs and then proceed slowly to Mobile, Ala., and the Gulf by way of the Panama Canal. She isn't due in Mobile until some time in February.

The vessel has a 13-foot 6-inch draft and displaces 165 tons. Her diesel engines can generate electricity for a 75-horsepower electric motor. Her lower hull is made of 1 ¾-inch steel and she is operational to a depth of 2,200 feet. Optimum sub-surface authorized time is 10 hours.

Capt. Bob Eastaugh of Yorkshire, England, is taking over here as the submarine's skipper from acting master Robert Strijckers, a Belgian. Brian Gorbell is chief engineer.

The Auguste Piccard is accompanied by a support craft, the nattily painted blue and white shrimp boat Diamond Lady, which is expected to continue to Mobile to lend a hand if trouble develops on the researcher.

NOV 78

Mantis is a second generation submersible. It has been designed by OSEL to fulfil the demand for a small yet robust vehicle capable of undertaking a wide variety of underwater tasks. Although only 2.5m long it has a payload of 200 kg. Flexibility is the key to its design. It has been constructed not only to meet the current demands of the offshore industry but also as a basic submersible to which additional tools can be added to fulfil future requirements.

Mantis is an ideal tool for inspection, surveys, repair and maintenance of subsea structures, offering a mid-water and sea bottom working capability. It can be used as a one-man atmospheric submersible or as a remote controlled vehicle.

The work frame can carry a variety of tools and cameras and the various manipulators can be fitted with devices suitable for a wide range of tasks.

The operator, working in a "shirt-sleeve" environment, operates the manipulators from hand controls attached to the central console.

Comfort has played an important part in the interior design of the submersible. Under normal working conditions the operator lies on his front on an ergonomically designed couch. However, when travelling through the air/sea interface, the operator can turn onto his back and strap himself down during the rough transitional passage.

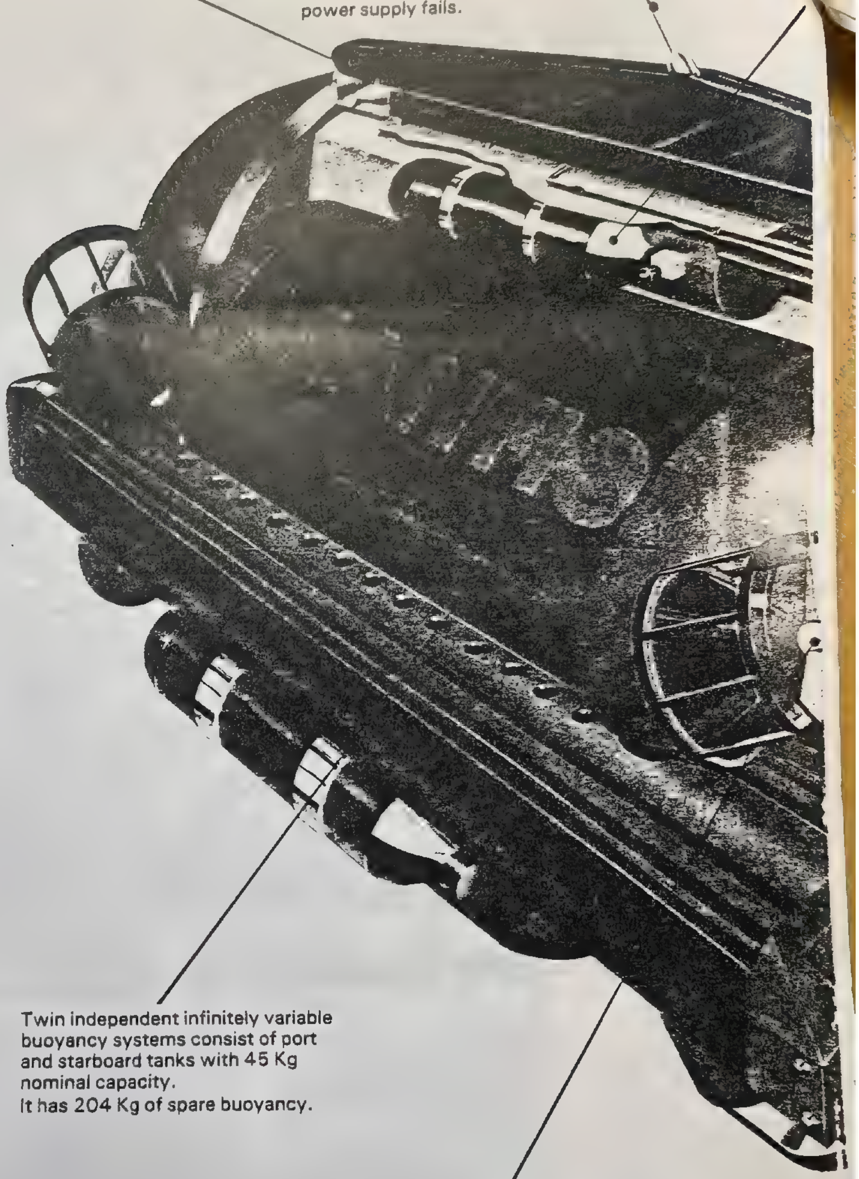
Working to depths of 610m in often cramped conditions, safety has played an important part in the Mantis design. The basic life support capsule consists of a cylindrical hull to which are attached pods holding the manipulators and thrusters, a skid containing the batteries and a work frame for attaching tools and TV camera and lights. In an emergency, such as snagging or power failure, each piece of external equipment can be released from inside the submersible and the operator switches to the emergency life support system.

Mantis has been designed so that repair and maintenance of the submersible can be carried out with ease. Working parts and power supplies are in modular form and are easily accessible.

The submersible is supplied as a complete operational package, weighing approximately 5.5 tons. The handling equipment has been designed to take up as little space as possible on the platform or vessel. A back-up system, consisting of another submersible or ADS, is normally supplied as part of the working package.

The submersible is:
- 1000Kg. in weight
- 2.5m long
- 1.37m wide
- 1.07m high

Mantis is available for lease or sale from OSEL Mantis Limited.



The body of the submersible is constructed of filament wound resin impregnated tube with aluminium LM25 end rings.

The armoured umbilical cable linking Mantis to the surface gives full power for the duration of the operation, as well as video and hard line communications
Emergency onboard batteries automatically give 40 minutes of full thruster power if the surface power supply fails.

Twin independent infinitely variable buoyancy systems consist of port and starboard tanks with 45 Kg nominal capacity.
It has 204 Kg of spare buoyancy.

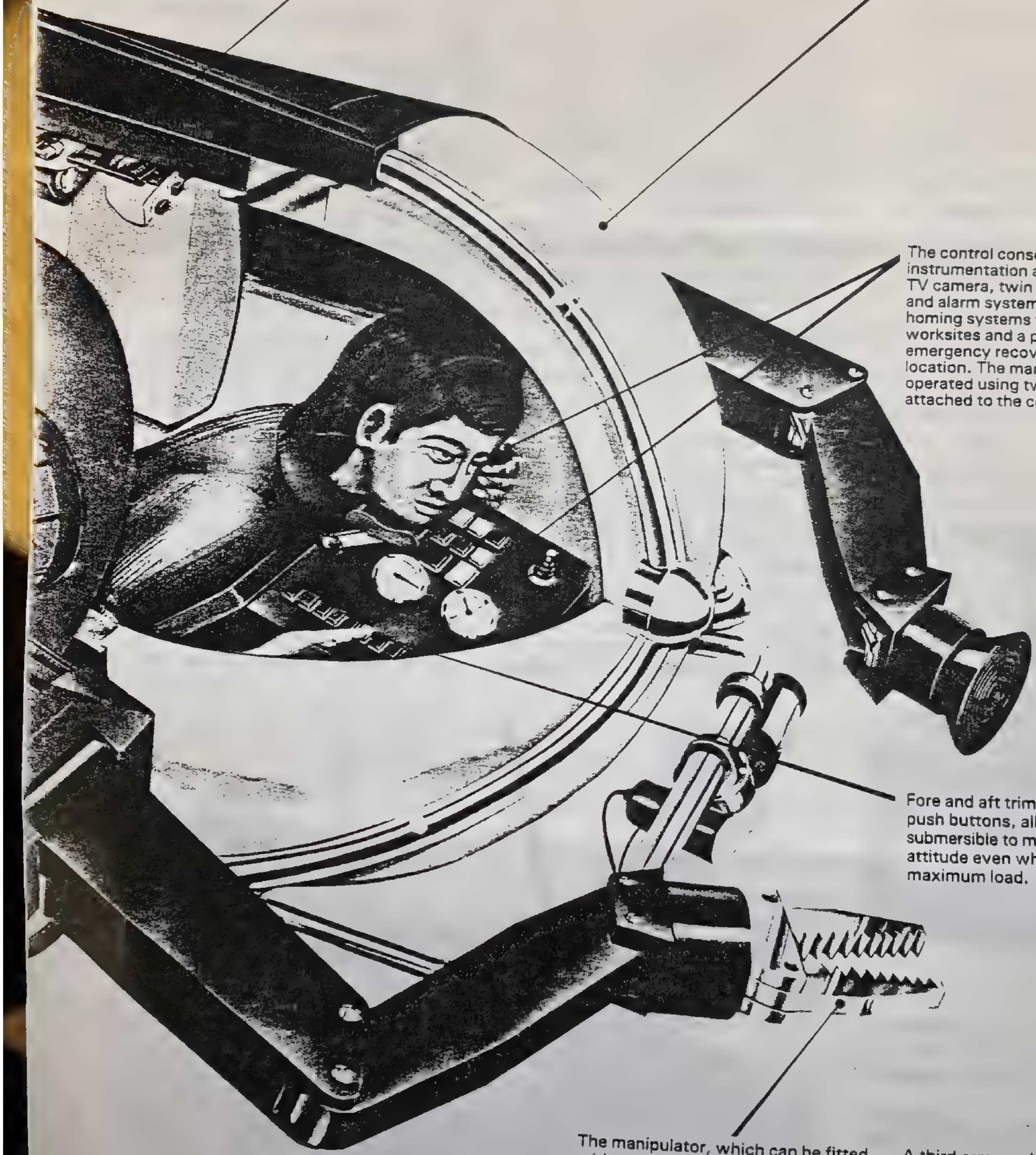
The eight thrusters allow complete freedom of movement through 360° in the horizontal plane and vertical movement.

N.B. The illustrations in this brochure are artist's impressions and the company reserves the right to alter

ilt-in life
ve a total of 40
acity. Each is fully
n operate as a
n the event of a
ical failure.

Twin communication systems consist of a hard line set and through the water communication sonar.

63.5mm thick acrylic dome allows 360° of vision.



The control console houses all instrumentation and controls for the TV camera, twin communications and alarm systems, including sonar homing systems for location of worksites and a pinger mode for emergency recovery or possible location. The manipulators are operated using two hand controls attached to the console.

Fore and aft trim, can be adjusted by push buttons, allowing the submersible to maintain its horizontal attitude even when carrying its maximum load.

The manipulator, which can be fitted with a number of interchangeable claws, allows the operator to carry out a wide variety of underwater tasks with ease. The manipulator arms have been designed to be robust enough to take the impact should the submersible collide with objects (patents applied for).

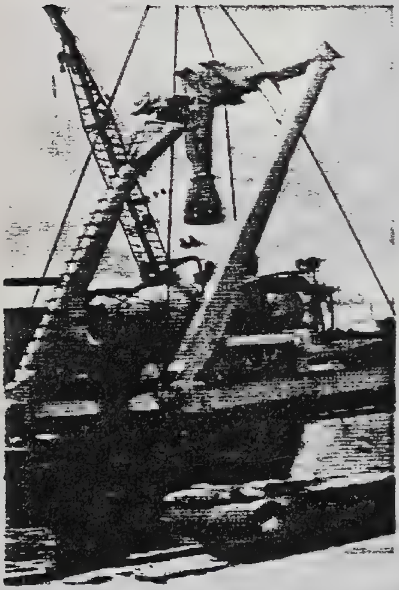
A third arm can be fitted to allow the submersible to attach itself to structures and it can be fitted with a grip or suction pad. Alternatively additional tools can be fitted, such as a wire brush or N.D.T. equipment, drawing on up to 1,000 watts of power.

Handling unit tough, but gentle

MICHAEL WITT
Technical Services Group
Martech International, Inc.

DESPITE the apparent strength inherent in the hull of manned submersible vehicles, the difficulties of safely launching and retrieving these vessels are formidable. The nature of the submersible's systems and its human cargo require that it be quickly, yet gently, moved through the violent air/sea interface zone.

At the same time, the handling system must positively locate the submarine to prevent its moving loosely about as its mother ship heaves, rolls and pitches with the seas. You can't just simply hook your submersible to a handy deck crane and yank it aboard in anything but the smoothest of seas.



These problems faced submersible operators as the North Sea oil boom developed, and over the years the method that has proven most successful is use of a U boom frame which lifts the submersible over the stern of the ship by hydraulic power. Usually, this type of handling system requires a fairly large, dedicated ship with the specialized handling gear permanently installed.

Martech International, Inc. of Houston, faced with the requirement for a handling system for submersibles, took a flexible approach.

Much of Martech's submersible work utilizes small, tethered, unmanned vehicles and meeting the objective of portability for these units was no big problem. When the submersible weighs many tons and carries two men, it presents a real challenge.

The requirements of deck loading factors, normally available transportation size and weight envelopes, ease of assembly and alignment, and operational requirements were also considerations. In order to minimize deck loads and provide for alignment, a self-supporting base structure was required. It was also necessary to be able to disassemble the entire system to fit on a 40 ft x 8 ft truck trailer or cargo aircraft.

After design by Martech's Technical Services Group, fabrication of the handling system was carried out by Reneau International, of Houston, Texas and was delivered in January 1978.

A comprehensive testing program was undertaken and the system has proven itself fully in successfully completing hundreds of launches and recoveries on a variety of ships in many different weather conditions, up to sea state six.

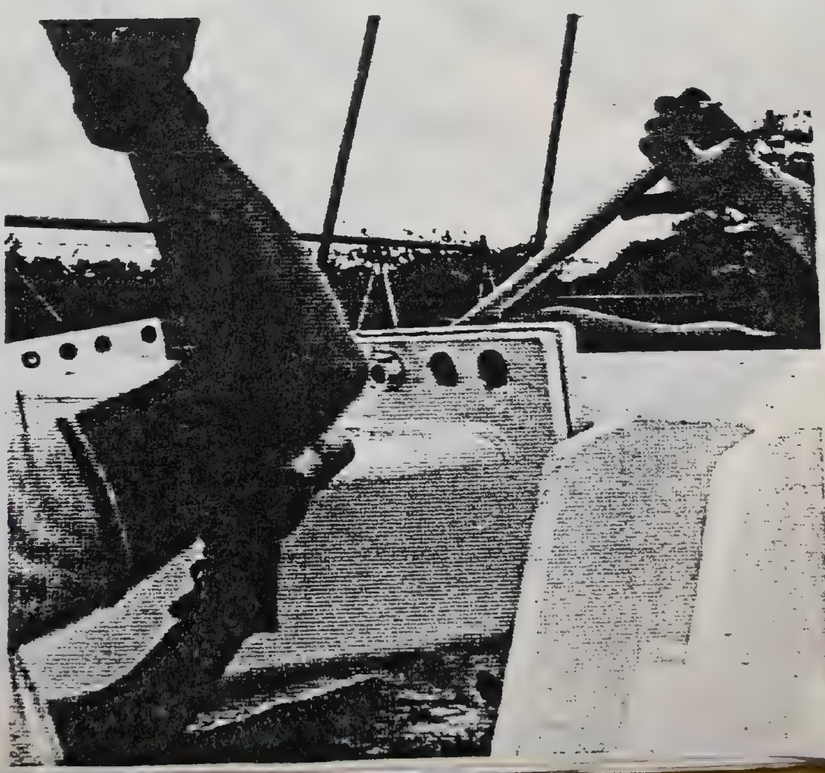
The entire system can be installed or removed from a typical offshore supply boat in about eight hours. Vessels from just over 100 ft to 180 ft have been successfully utilized with the system.

The basic components of the system are two hydraulic winches, the structural framework, hydraulic rams, diesel/hydraulic power supply and the control station.

The control station regulates all of the functions required to launch and retrieve the submersible. The submersible cradle snubber, main lift winch, in-haul winch and U-frame rotation are all controlled by one person.

The main lift winch is specially designed with redundant drives and failsafe braking system. Two and one-half inch diameter synthetic line is used in order to absorb shock, thus

(continued)



eliminating the imposition of high momentary loads on the submersible.

The in-haul winch is a high speed unit which tows the vehicle into position at the stern of the ship where it is positioned for the main lift. It also stabilizes the submersible as it is lifted onto or from the ship. No other lines are required to control the vehicle.

The structural framework consists of the base support and rotating U frame. These units are assembled with bolts and incorporate guide flanges to "automatically" align the bolt holes. This facilitates rapid assembly and eliminates tedious adjustment and alignment tasks.

A key component of the handling system is the "swing frame snubber." This device restrains the submersible from moving after it is pulled up to a position under the bottom of the swing frame. A conical guide and air cushions damp any tendency of the vehicle to swing as the U boom is rotated. The submersible is held firmly against the snubber during this rotation period since there is no relative movement of the main lift line to the U boom because of the way in which the main lift line is routed through a fairleading sheave which rotates around the pivot point of the U boom.

At the work site, the submersible and handling system are readied for launch. The hydraulic power supply is started, hydraulic pressure stabilized and checked and the system operator then cycles the in-haul winch to provide tension which will dampen pitch and yaw of the vehicle when it is lifted. The ship maintains headway into the sea as the handling system operator retracts the cradle snubber and lifts the submersible up into the swing frame snubber. The U frame is then rotated as constant tension is maintained by the in-haul winch to control pitch and yaw of the vehicle. When the U frame reaches its full outboard position the submersible is lowered into the sea.

A small rubber boat is then maneuvered alongside the submersible to release the main lift line. The handling system operator can then reel out line from the in-haul winch, trailing the submersible farther astern of the ship.

During the launch sequence up to this point the ship has been maintaining a speed of several knots, but can now stop while the in-haul line is released from the submersible, freeing it to dive.

The recovery sequence is the reverse of the launch except that it is possible for the ship to pass by the submersible waiting on the surface, passing the in-haul line to the rubber boat, which then takes it to the submersible, attaching the line while the ship remains underway.

Martech's submersible handling system is adaptable to a wide range of typical commercial submersibles, and when this is combined with its rapid mobilization and portability factors, the result is a system of unusually high flexibility. Meeting these design goals without having to sacrifice safety in operation or reduced capability to operate in high sea states is a significant achievement. ☐

Reprinted from the August 1978 edition
Copyright 1978 by the Petroleum Publishing Company

MARTECH
MARTECH INTERNATIONAL, INC.
Marine technology in depth.

13550 Hempstead Highway, Houston, Texas 77040
Tel. 713/462-0010, Telex 790163

6132 Nielson Way
Anchorage, Alaska 99502
Tel. 907/277-2478

400 David Love Place
Goleta, California 93017
Tel. 805/964-9894
Telex 696251

P.O. Box 2964
Morgan City, Louisiana 70380
Tel. 504/631-0335
Telex 762761

Chesham House, Suite 500
150 Regent Street
London WIR 5FA
Tel. 1-439-6288
Telex 261426

MARTECH INTERNATIONAL (PTE.) LTD.
Malayan Credit House, 14th Fl.
Somerset Road
Singapore 9
Tel. 378966
Telex 24094

Litho in U.S.A.

Director of the Institute, **Dr. Don Walsh**, is also MTS Vice President, Resource Management and Law, and Editor of the MTS Journal. Under his direction the Marine Science Center has developed a three-tiered education and research program in cooperation with the University's Department of Biological Sciences: an intensive Marine Biology Semester for qualified juniors and seniors; graduate-level courses; and individual research studies. The Center also serves as the site for conferences and extension courses. A recent addition to the Catalina facilities came in the form of a gift from the Wrigley family of the Mt. Ada estate on Catalina Island. The gift includes furnishings and improvements, as well as the residence and five acres of landscaped grounds, with the provision that the University is to utilize the property as an academic and cultural center. Dr. Walsh believes that Mt. Ada "will prove highly suitable as a facility for seminars and other activities of the Institute for Marine and Coastal Studies and other departments."

Specialist, Becomes Head of NRL

Captain Edward E. "Buzz" Henifin, submariner and deep submergence submersible operator, became Commanding Officer of the Naval Research Laboratory in Washington, D.C., July 31. (See picture in People column, *ST* September.)

Henifin, 47, a graduate of the U.S. Naval Academy in the class of 1954, relieved Capt. Lionel M. Noel, who retired from the Navy. He attended postgraduate school at the University of Washington after initial duty aboard two submarines, receiving a B.A. degree in physical oceanography in 1962.

Serving aboard the *USS Albacore* (AGSS-569), an experimental submarine, he rose to the post of executive officer. During that tour of duty in 1963 the submarine participated in the search for the downed submarine *USS Thresher.*

His involvement with deep submergence began in his next duty when he was made Officer-in-Charge of the Bathyscaph *Trieste II.* He then became Commanding Officer of the *USS Pomfret* (SS-391).

Henifin then continued his deep submergence involvement with duty in the Pentagon as deputy director of the Deep Submergence Systems Division (OP-23) under the Chief of Naval Operations.

In 1975 he reported to the Naval Material Command where he was deputy director of Navy Laboratories. He moved to the office of the Director of Navy Technology as deputy in February, 1977.

Henifin is a designated Deep Submergence Vehicle Operator and a designated subspecialist in Oceanography.

Among his temporary duties he participated in the search for the H-bomb off Palomares, Spain in 1966. He holds the Navy unit Commendation Ribbon for the *Thresher* and H-bomb searches, the Navy Achievement Medal for his performance aboard *Trieste II* and the Meritorious Service Medal for the planning and participation in deep submergence operations in 1971.

COMEX Offers New Lockout Submersible

COMEX Industries, Marseilles, France, has introduced the SM358 Lockout Submersible, a new observation and diving unit that can perform three types of missions.

It can be used for observation missions up to eight hours duration to 300 m with a pilot and observer. It can conduct atmospheric transfer operations on seabed production facilities to 300 m and can handle diving missions with a pilot, observer and up to three divers for four hours bounce diving to 100 m with the diving compartment pressurized or two hours saturation diving to 200 m with compression onboard ship.

The submersible's top speed is three knots. The unit has a pressure-resistant hull divided into two compartments. The spherical forward compartment, kept at atmospheric pressure for the pilot and observer, contains navigation instruments and controls; the cylindro-spherical diving compartment, fully equipped with apparatus necessary for saturation and bounce diving, can be pressurized to 20 bars.

Compass Award won by LMSC

WASH., D.C., Sept. 8 — The Compass Industrial Award went to LMSC for its outstanding contributions in the advancement of ocean science and engineering. We were cited for our work in deep-ocean technology.

Marine Technology Society president James A. Rickard presented the award at the society's annual meeting. It was accepted by James G. Wenzel, vice president of LMSC's Ocean Systems organization.

The citation reads as follows:

"The Lockheed Missiles & Space Company is hereby recognized for its imaginative and important contributions to deep ocean technology as typified by the development of the deep sea submersible, DEEP QUEST, and the one-atmosphere sea floor system of oil-well completion.

"For these and other contributions, and for its consistent support of the concept of the oceans as a technological challenge to be developed for the benefit of mankind, Lockheed Missiles & Space Company is presented this award."

The Compass Industrial Award was established to stimulate the development and application of new equipment and techniques in oceanographic exploration, research and survey, undersea defense, ocean transportation, fisheries, and other oceanographic activities. It honors those industrial firms making significant and outstanding contributions in these areas.

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

FEBRUARY,1979

Vol. XIII,No. 1 Published by the Deep Submersible Pilots Ass'n

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to:

Robert K. R. Worthington
Editor & President, DSPA
3005 Curie Street
San Diego, CA 92122
(714)453-1158

(or)

Donald E. Saner
Secretary, DSPA
4707 Berwick Drive
San Diego, CA 92101
(714)278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman, DSPA
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

This is the first NEWSLETTER of 1979 and was preceded by the November issue--in case you had lost track. From time to time, I receive complaints of non-receipt of NEWSLETTERS. Almost invariably, it turns out that a home or business address had changed and the NEWS was either returned to me or died at the old address. For instance, I am still holding Bob Starr's November issue, returned as non-forwardable from the Martech address in Houston, the only address that I had for Bob. I hear that Martech moved, but I have no new address. PLEASE send me me your address changes promptly. It does not pay you to lose contact; it costs DSPA; and it adds to my gray hair (if that is conceivable!).

The NEKTON electrical system controversy elicited additional comments only from Larry Shumaker (generally con) and Rich Slater (highly pro). A description of the system and pertinent information is contained in this issue in addition to a letter from me to ABS with which you may or may not agree. Comments welcome!

Larry Megow has accepted the office of Chairman of the DSPA-OTC meeting in Houston on Wednesday, 2 May, 1979. Please notify him if you may be there. Rich Slater reports he'll be present.

SECRETARY'S REPORTS AND NOTICES

Dues for 1979--Enclosed with this NEWSLETTER, you should have found a card giving the amount due on your 1979 dues. The amount varies because some members are partially or wholly paid up in advance. Please remit your check immediately to the Treasurer, Secretary, or President/Editor, as convenient, before it slips your mind.

DSPA Constitution-- If you never received a copy, please notify Editor or Secretary.

DSPA San Diego Luncheon Meetings

11/21/78---Met at 1145 at Tarentino's Restaurant.

Members Present
Bob Worthington
John Cameron
Will Forman
Merle Wilson
Doug Privitt
Carroll Hoyt
Don Saner
Rick Olsen

Non-Members Present
J. R. Denzien-TRIESTE II
Tom Vetter-TRIESTE II
Al Smith-DEEP QUEST
Jack Bennett-Gulf Maritime, Inc
Ken Privitt-MARFAB, Inc

Don Saner reported a successful DEEP QUEST 15- hour midwater run at depths to 3900 feet to test the fuel cell in DEEP QUEST. 222 KWH were used from the fuel cell during the test, leaving about 80 KWH available (plus the entire capacity of the remaining lead-acid battery =50% of DEEP QUEST's original installation).

Doug Privitt passed out a 4-page description and justification of the NEKTON electrical system (prepared by son Ken) along with a monograph on "Human Electrical Safety" published by the Instrument Society of America. Ken's paper will be published in the February NEWSLETTER.

Jack Bennett reported that AUGUSTE PICCARD is making daily training dives off San Diego. Present intentions are to remain here at least until February.

Next luncheon will be held in mid-January.

1/15/79---Met at 1145 at Tarentino's Restaurant.

Members Present
Bob Worthington
Jerry Shiller
Doug Privitt
Don Saner
Will Forman

Non-Members Present
Jack Bennett-Gulf Maritime, Inc.
Ken Privitt-MARFAB, Inc.
R. W. Eastaugh-AUGUSTE PICCARD
Fred Wagner- "
Mark Isaak- "
Rick Rios- "
Brent Anderson- "
Sue Stepan-SILVERSIDES

Sue Stepan was introduced as the ex-Secretary/Public Relations/Newsletter Editor of the Great Lakes Navy Association project which has transformed the WW II submarine SILVERSIDES into a Chicago showpiece memorial visited by thousands annually. (Editor's note: I made 9 consecutive war patrols in SILVERSIDES in '42-'43.)

Jack Bennett reported that AUGUSTE PICCARD would sail from San Diego on 19 January enroute through the Canal to Florida, first stop to be at Acapulco.

Doug Privitt reported no progress on his request for a waiver from ABS on their rule banning grounded electrical systems, regardless of the voltage involved. Bob Worthington reported that the only letter received from a Member on the subject was from Rich Slater, strongly supporting the NEKTON system.

Jerry Shiller announced that the NEKTON support ship SEAMARK would sail tomorrow for geophysical operations in the Gulf of Mexico. Their new support ship SEAHAVEN is essentially complete and will be ready shortly for operations in the Gulf, also.

Next luncheon will be on 12 February.

2/12/79---Met at 1145 at Tarentino's Restaurant.

Members Present
Bob Worthington
Don Saner

Non-Members Present
Chris Landrum-Lockheed Petroleum
Capt. Pete Branson-Scripps Inst.
Mel Wills-DEEP QUEST/TRANSQUEST
Al Smith-DEEP QUEST

Don Saner reported that he will be assisting Mel Wills on board Lockheed's TRANSQUEST for the next five weeks while Skipper Dave McCafferty is on leave. R/V SEACLIFF was offloaded today and DSRV AVALON will be embarked for a period of test/training operations. TRANSQUEST now provides support services to four Navy deep submersibles as well as to DEEP QUEST.

Pete Branson reported that Scripp's latest ocean research ship, NEW HORIZONS, will be ready for sea at Nimitz Ocean Lab on 22 Feb.

Mel Wills gave a description of his bargain insurance sale acquisition of a 50' seagoing vessel on which he and spouse now reside. It is worth at least twice the sum Mel has spent to date. They will soon depart on a five-week cruise to Mexican waters.

Chris Landrum described the fabrication and use of Pyrotenex, a drawn copper sheathed electrical cable which is almost impervious to physical damage, makes an impressively neat installation, and is highly efficient electrically. It is used in AUGUSTE PICCARD and the Lockheed Petroleum Services capsules, wellhead cellars,etc.

REPORTS FROM MEMBERS

Rich Slater (12/6/78)

"I am planning on attending the O.T.C. meeting in Houston next spring and will attend the DSPA meeting on Wednesday, May 2, 1979. This past summer I was chief scientist for the United States Geological Survey on a submersible cruise off the east coast. We used Texas A&M's "DIAPHUS" (run by MARTEK) for a series of dives along the upper continental slope mapping submarine slumps and other geological hazards. Hope to continue the work next summer. Guiness Book of Records has updated its "Deepest Underwater Escapes," now listing the recovery of PISCES III off Ireland in 1973 as the deepest underwater rescue and my escape from NEKTON BETA off Catalina in 1970 as the deepest actual escape without any equipment. Hope to see you and others in Houston as I am quite concerned over the issue raised on the grounded electrical system used in the NEKTON's. I have personally made over 600 dives in NEKTON subs and found the system to be simple, very reliable and safe. I would like to be on record as supporting Merle and Doug."

Kevin Parker (11/29/78)

"Since I left P.O., I have been working for Hyco as Senior Pilot on the HUDSON HANDLER/LEO and on the DISCOVERER SEVEN SEAS/PISCES VI, which was working off Bari, Italy. But as you will know over there, something has happened to Huco, so as from now I am looking for alternative employment. On that line I would appreciate it if you could mail me a list of any one Stateside who is taking operational crews. I have taken the liberty of enclosing a resume which may be of use to anyone over there. I formed a company for tax purposes while I was being paid from America. The mane of it is Kayce Submersible Services, address as above (home address). I am also checked out on PISCES VI now, thanks to Robin Gauss who was the only Pilot on board when I joined DSS. I did a grand total of four dives! It really was not all that much different from LEO at all, although I did miss LEO's excellent visibility. (She now has a conning tower fitted.)"

Frank Chambers (12/7/78)

"Taking advantage of some spare time to bring you up to date on PISCES LV activities. As you possibly know, PISCES IV was at the Canadian National Exhibition in Toronto this summer as part of a huge Government display by most federal departments. It was overall a great success and in particular PISCES IV turned out to be the star attraction with an estimated 2,500,000 visitors. The Canadian Government display overall had a total of 3,000,000 visitors. We were fortunate to be able to attend due to our tender PANDORA II being used in the Arctic by Hydrography, thus depriving us of our operating platform. PANDORA returned in late Sept and we commenced operations with six weeks of ocean turbulence studies, then into environmental studies. This brought us up to December and we are again away working the inlets of the mainland British Columbia coast doing biological studies. In early January, PISCES IV will go into International Hydrodynamics in North Vancouver for a conversion to allow us to operate at our full diving depth of 6,000 feet. This work which will include the removal of our 72" diameter after sphere, the addition of a large drop weight for trimming, and increased H.P. air capacity from 3,000 psi to 5,000 psi. should be completed by the end of March; we are not certain of our program then but know it will be busy, possibly the Arctic again and some East Coast operations. We are in a new department, not Environment Canada any longer but Fisheries & Oceans Canada."

Alan Whitfield (12/6/78)

"At present, I am on the Vickers Voyager with TAURUS "A" and LR-5. We are operating as a back-to back saturation diving unit in the North Sea for lockout depths up to 1,000 ft. TAURUS is on loan to Vickers Oceanics from Hyco. Reference the International Underwater Pilots Association, I see this organization as being the European Branch of the DSPA At present, membership is 23, and a quarterly newsletter is prodiced. Basically, the IUPA is an information source for the European Pilots-giving news of who is doing what and where, jobs, news from DSPA, plus any other items of interest on the European scene. I act as the Secretary/Editor and co-ordinate all activities. For obvious reasons, I wish to maintain a close contact with the DSPA. The DSPA is regarded as our "parent body" with ourselves being an arm of that body. Thus all aims, rules, and ideas will hopefully apply to you and us. I would like to maintain my own membership of the DSPA and, thus, act for and co-ordinate the activities of the DSPA/IUPA. The name IUPA came about as follows. A friend of mine, Keith Julian, formed an organization in the U.K. for all wet submersibles/diver transport vehicles/and other "U/W pilots". However, as he received interest from many dry, deep sub pilots, it was felt that a second organization was requires. Thus, the IUPA 'Wet Submersible Section" and the IUPA "Deep Submersible Section came into being. Enclosed are my April and October Newsletters. Also one of Keith Julian's "Wet Section" Newslatters.

DEEP SUBMERSIBLE PILOTS ASSOCIATION

3005 Curie St.
San Diego, CA 92122
January 31, 1979

American Bureau of Shipping
45 Broad Street
New York, NY 10004

Attention Mr. John Reiter

Gentlemen:

It appears that a problem has arisen with regard to classification of certain manned submersible vessels due to the establishment of an absolute rule against use of single-wire circuitry using the hull as one leg of an electrical system, i.e., a "grounded" system.

General application of such a rule is undeniably required in the interest of safety and minimization of electrolytic corrosion. However, there are strong grounds for some careful exceptions to be made in the case of simple, well designed, low voltage,low amperage circuitry in systems which can demonstrate safety and freedom from corrosion. Furthermore, some consideration should be given to the value gained by the decrease in number of hull penetrations effected in such a system, particularly in very small submersible vehicles such as the NEKTON design.

Dr. Richard A. Slater, Chairman, Department of Earth Sciences at the University of Northern Colorado, wrote to me as follows:

> "I am much concerned over the issue raised on the grounded electrical system used in the NEKTON's. I have personally made over 600 dives in NEKTON subs and found the system to be simple, very reliable and safe."

I share his concern and urge the American Bureau of Shipping to provide in the Rules for carefully considered approval of exceptions to the Rules affecting classification of manned submersible vehicles when builders and operators can demonstrate the safety and effectiveness of their designs. Absolute requirements and prohibitions should not operate in an arbitrary manner to discourage the innovative designer from devising a "better way" of doing things in this infant field or to restrict continued operation of a proven vehicle system.

It would be patently undesirable and unfair to permit economic factors resulting from unnecessary requirements placed on any manned deep submersible vehicles to jeopardize their continued service to industry, research, and exploration.

Sincerely yours,

Robert Worthington

Robert K. R. Worthington
Captain, U.S.N. (Ret.)
President,
Deep Submersible Pilots Ass'n

First Year Successful For COMEX Diving Bell

Comex Industries, Marseille, France, has successfully completed the first year of operation of the MOB 1000 series manipulation observation bell capable of working with two pilot divers at depths as great as 1,005 m and within a radius of up to 1,650 ft. from the mothership. The MOB, a spherical deep diving bell, is powered by eight 3-hp thrusters; it has three large concave viewports and five smaller flat viewports allowing maximum visibility in front of and below the bell.

The MOB was installed on the drillship *Pelerin*, for Staubo-Total and made 11 dives during 1977 in the North Sea and off Algeria and Greenland. The MOB 1002, installed on the drillship *Discoverer Seven Seas* for Offshore-Seagap, made 76 dives in the Red Sea and off the coast of Abidjan last year.

Perry Oceanographics Builds New Undersea Work System

Seaforth Maritime Ltd., Aberdeen, Scotland, has awarded Perry Oceanographics, Riviera Beach, Fla., a contract to design and construct a new concept in undersea observation, maintenance and repair vehicle called a Mobile Diving Unit (MDU). The unit will be a major component of a 16-man diving complex being built by Seaforth for Occidental Petroleum. Scheduled for delivery in early 1979, the system will be used aboard Occidental's semisubmersible multipurpose support vessel which will be used in the Piper and Claymore offshore oil fields in the North Sea. The Perry MDU, based on both diver lockout submarine and conventional diving chamber technology, will give the divers horizontal mobility and nearly unlimited electrical and hydraulic power at the work site. The MDU is an 18-ton, 304.8 m depth rated vehicle capable of maneuvering in any direction.

Electrical System Design Considerations For A Nekton Type Submersible

by

Kenneth W. Privitt

The Nekton type two man submersibles are simple, easy to operate and maintain, research oriented vehicles with an outstanding safety and reliability record. Their small size and light weight makes them readily transportable by air, land, or sea. They have excellent visibility through the nineteen viewports strategically placed throughout the vessel.

The power source consists of eight 6.0 volt 244 ampere-hour lead acid batteries in two separate sealed compartments. The batteries in each compartment are wired in series to obtain a 24.0 V potential. A 12.0 V tap is available from one of the compartments. All leads are connected within a sealed junction box on which are mounted the main circuit breakers supplying current to all the electrical equipment.

The negative terminal of the battery bank is grounded to the hull. i.e. The external lights and instrumentation lights use the hull as an electrical conductor. However, the majority of the current flows in a two wire system. This was done to reduce the number of thru-hull penetrators and underwater connectors.

Grounding the negative terminal of the batteries and running current through the hull is in conflict with the 1968 Guidelines for the Classification of Manned Submersibles as published by the American Bureau of Shipping. " 6.6.1 Ungrounded Systems - The submersibles structure is not to be used as a current carrying conductor for power, heating, or lighting. All electrical power distribution systems should be ungrounded to minimize the occurance of faults and stray currents which may create galvanic corrosion.[1]"

I submit that the above guideline which applies to all manned submersibles (ranging from the Trieste II with a 20,000 foot capability to the PC3-X with a 150 foot capability) does not consider the widely varying designs of different submersibles. I will show in the following analysis that a grounded system is acceptable and indeed better than an ungrounded system in particular applications.

The areas of major concern in submersible electrical systems are (1) the reliability of the system (2) the possibility of galvanic corrosion, and (3) the potential shock hazard. All systems should have overload protection and adequate monitoring systems.

1. American Bureau of Shipping, " Guide for the Classification of Manned Submersibles ", 1968, p.19

Reliability

In an electrical system the two major modes of failure are short and open circuiting. Typical causes of shorts are abrasion of the wiring, deterioration of the insulation due to age and environmental conditions, shearing, human error, etc. Causes of open circuit failures typically are abrasion, shearing, excessive current, and fatigue. The probability of a failure in an operating system is proportional to the complexity of the system and to the length of time it is in service.

Let the amount of wire used in a two wire (ungrounded) system equal 2ℓ. For a similar one wire (grounded) system the amount of wire necessary is equal to ℓ. Let the service life of both systems equal t. Let β equal the probability of a unit piece of wire to have a short circuit failure per unit length-unit span of time.

$$\beta = \frac{P_s}{\Delta\ell\,\Delta t}$$

Similarly, let γ equal the probability of a unit piece of wire to have an open circuit failure per unit length-unit span of time.

$$\gamma = \frac{P_o}{\Delta\ell\,\Delta t}$$

I am assuming that the system is large enough so that the incremental probabilities are linear over a short range.

The probability of a short circuit failure for a one wire system over the life of the submersible is

$$P_{s_1} = \beta\ell t$$

Similarly for a two wire system

$$P_{s_2} = \beta 2\ell t$$

However, two shorts are necessary in a two wire system for a failure to occur, and they must be distributed one short on each wire. Two shorts on a single leg does not constitute a failure. Therefore, the true probability of a short circuit failure for a two wire system is

$$P_{s_2} = \frac{\beta 2\ell t}{4}$$

$$= \frac{\beta\ell t}{2}$$

The probability of a short circuit failure is twice as great for a single wire system as it is for a two wire system.

The probability of an open circuit failure for the one and two wire systems are

$$P_{o_1} = \gamma\ell t$$

$$P_{o_2} = \gamma 2\ell t$$

(2)

The probability of an open circuit failure is twice as great for a two wire system as it is for a one wire system.

The total probability of a failure is the sum of the open and short circuit probabilities

$$P_1 = \beta \ell t + \gamma \ell t$$

$$P_2 = \frac{\beta \ell t}{2} + \gamma 2 \ell t$$

Assuming equal probabilities of open and short circuit failures $\beta = \gamma$ (It has been my personal experience that open circuit failures occur more often, however, for theoretical analysis equal probabilities seems a reasonable assumption) There is no difference between the total probabilitiy of failure $P_1 = P_2$. There is no comparative advantage of one system over the other in terms of fault occurances.

Corrosion

"The requirements for the electrochemical nature of the corrosion process are: (1) anodes and cathodes must be present to form a cell, (2) the anode and cathode must be in electrical contact, and (3) the liquid environment must serve as an electrolyte. At the anodic site an oxidation process occurs and the metal goes into solution via a reaction of the type

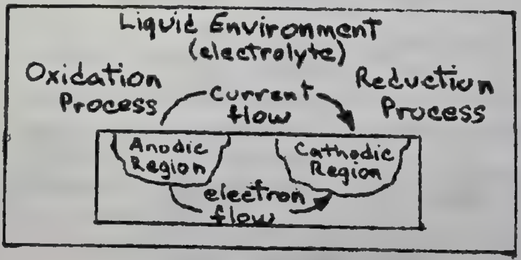
$$\underset{\text{(metal)}}{Fe} \longrightarrow 2e^- + \underset{\text{(ion in Solution)}}{Fe^{++}}$$

At the cathode a reduction process occurs that generally results in the reduction of dissolved oxygen or the liberation of hydrogen gas. These two reactions can be written as

$$\underset{\text{(in solution)}}{O_2} + 4e^- + 2H_2O \longrightarrow \underset{\text{(ion in solution)}}{4OH^-}$$

$$\underset{\text{(in solution)}}{2H^+} + 2e^- \longrightarrow \underset{\text{(gas)}}{H_2}$$

The actual corrosion process occurs at the anode, where metal ions leave the metal surface and enter the solution. At the cathodic region there is no corrosion, and this is the area where electrons flow from the metal to the solution[2]"



Schematic illustration of metallic corrosion[3]

---

2. Barrett, C.R., Nix, W.D., Tetelman, A.S., "The Principles of Engineering Materials",,1973, p.182-3

3. Ibid

In the grounded system the negative terminal of the battery is connected to the hull, forcing the hull to be cathodic in any galvanic action driven by the battery. Under normal operating conditions all electrical conductors are insulated. Thus, condition (2) is not met and corrosion will not take place. In the event of a fault satisfying condition (2) the hull will be protected by the cathodic reaction. (i.e. The wire will be the anode which corrodes causing an eventual break and loss of the particular system) It is standard procedure to ensure that all inoperative systems are switched off.

If a fault occurs in a two wire system the positive terminal of the battery could become grounded, forcing the hull to become an anode and cause possible serious hull corrosion. Therefore, it is necessary to carry a ground fault detector in such a system to ensure against such an eventuality.

It should be noted that high currents are not recommended for use in a single wire system due to the fact that the hull has a finite resistance. It is possible that high currents could cause a potential difference large enough to make a portion of the hull anodic and subject to corrosion. For this reason only the external lights and instrumentation lights utilize the one wire system in Nekton vehicles. (This greatly enhances the reliability by a 50% reduction in thru-hull penetrators and underwater connectors) The Nekton type submersibles are coated with Dimetcoat, a zinc based paint, to combat this problem along with general corrosion associated with any steel vessel in a salt water environment. Especially note that this form of grounded system has been in use for more than twenty years and 3,000 dives in the Nekton vehicles with no evidence of corrosion due to galvanic action.

Electrical Shock

The shock hazard must be considered in a grounded system because human contact with one leg of the potential is readily available throughout the vessel. (i.e. The hull) While in an ungrounded system the hull is isolated and human contact with the potential is greatly reduced.

"A shock current very readily overpowers the millivolt operating levels of the nerve electrical system. It drives the muscles much harder than normal command impulses, either throwing the victom vigorously away from the contact or freezing him onto the contact so that he cannot be released until it is de-energised.[4]" The current level required to freeze a persons motor system is approximately 10 milliamperes. The asphyxiation threshold is 30 milliamperes and the 50% fibrillation threshold is 80 milliamperes.

---

4. Lee, Ralph H., Electrical Safety Practices ISA Monograph #110, "Human Electrical Safety", 1965, p.27-33

"By Ohms Law, current is voltage divided by resistance. The resistance in this case is the resistance of the human body and any other elements in the path of the current, such as the floor, shoes, or gloves. The resistance of the human body is mostly in the skin.[5]" The resistance of a wet hand-wire interface with an area of approximately 1.5 square inches is about 8,000 ohms. The internal resistance of the human body is 500 ohms. The resistance of an immersed foot with an area of approximately 60 square inches is about 100 ohms. This worst case total resistance is 8,600 ohms. With dry hands or rubber shoes the resistance is significantly greater.

The largest voltage available in a Nekton type submersible is 48 V DC. This would give rise to a 5.58 milliampere current flow, which is below the 10 milliampere "no-let go" threshold. The human body is five times less sensitive to DC voltages than to AC sources. The criticalcurrent values mentioned apply to 60 cycle AC acting on a 150 pound person. Therefore, there is no serious shock hazard which will lead to death or serious injury in Nekton type vehicles because of the low voltage. Higher voltages (greater than 50 V RMS) should not use a grounded system because of the increased likelihood of serious injury due to current flow.

The grounded system is more reliable and safer than an ungrounded system because of the reduced number of thru-hull penetrators and underwater connectors. It does not lend itself to significant galvanic corrosion as evidenced by twenty years of service. There is no serious shock hazard from a system with less than a 50 V RMS power supply. Therefore, I believe a grounded system is the best choice for use in Nekton type vehicles.

TRANSQUEST hosts U.S. Navy's DSVs

TRANSQUEST, Lockheed's unique submersible support vessel, played host to all four of the U.S. Navy's Deep Submergence Vehicles in the San Diego area during the final weeks of 1978. The support ship for the Lockheed submersible, DEEP QUEST, spent the final month working with the DSVs SEA CLIFF and TURTLE, and the Deep Submergence Rescue Vehcles AVALON and MYSTIC. The two DSRVs were designed and built at LMSC.

All of the submersibles conducted routine dives following maintenance periods or crew proficiency training.

According to Bob Tyrrell of 57-90, director of the Lockheed Ocean Laboratory, this is the first time that all four of the Navy's deep boats have successively used the TRANSQUEST, although all the boats have previously dived from the TRANSQUEST at one time or another.

The 108-foot-long TRANSQUEST displaces 425 tons, and its twin screws are powered by a pair of diesel-electric engines.

---

5. Ibid

International Underwater Pilots Association

DEEP SUBMERSIBLE SECTION.

Secretary:- A. Whitfield,
12 Frankton Ave.,
Haywards Heath,
West Sussex.

October 1978

A bizarr plot to attack Soviet and Japanese Whaleboats off Chile is being investigated in Miami. An eviromentalist "Hit Squad" planned to use a yellow two man submarine to blow up the boats that hunt and kill the great Pacific whales. The plot was uncovered when FBI agents, acting on a tip, raided the home of a former US Navy demolition expert.

Kockums have recently completed trials with the URF. This rescue submersible is able to lock on to crashed submarines at a depth of 1500 feet. It has a weight of 25 tons, is air portable and can carry 25 passengers. It has a diver lockout capability to 1000 feet. It will now replace the Swedish Navy rescue diving bells.

Unfortunatly, due to restructuring within Vickers Oceanics the following pilots have left the company:- T. WEBB, R. MALLINSON, R. BARR, K. BRUMBY, and M. BATTY.

Other recent news is that Tom Cardale is now the Ops Chief on the diving support ship "Star Canopias".

Deep Diving Systems, Thunder Bay, Ontario, are building a new tethered hyperbaric submersible called "Constructor". It will be used in Lake Superior and Lake Ontario, for archeological salvage. It will have an operating depth of 1600 feet.

The French submersible "Cyana" has been busy recently doing a pipe survey from Algeria to Spain, down to depths of 6600 feet.

News from the Harbour Branch Foundation, that the "Johnson Sea Link I & II " have been working off the Florida coast. The company is building a third submersible using acrylic spheres at either end. This will give maximum visibility to use the manipulators.

Jobs currently advertised are as follows:-

1) Horton Maritime Exploration require a relief Captain and technicians for the Submersible "Agguste Picard", whilst she is operating in the Gulf of Mexico. Write to Captain Bennet, H.M.E., Welch Street, North Vancouver, CANADA.

2) Operations personnel are required for the unmanned submersible "Smartie". Contact, A. Stephens, Marine Unit Ltd., 3, Friars Lane, Richmond, SURRY.

3) Perry Ocean Engineering, PO Box 10297, Riviare Beach, Florida, are looking for experianced offshore engineers to work on major undersea programs, which include RCV's Submersibles, and Dive Systems.

hinder trawl nets, or endanger divers or the pipe itself.

'*Rubbish* will consist of empty oil drums; boxes; tins; small tyres; short pieces of wire; hand tools; helmets; rubber hoses; fish nets; ropes and any other minor or small objects considered to be unable to damage or hinder trawl nets, or endanger divers or the pipe itself.'

The final decision concerning what action should be taken regarding any target was left to the client's representative on board. It should be noted that elongated targets — scour marks or possible wires — located more than 50m from the pipe were not inspected unless they extended into the 100m wide strip centred on the pipe.

Field procedures

Before each dive, the submersible crew and operations controllers were given a thorough briefing, which included presentation and discussion of target discription.

Normally, a pinger was deployed in the target area prior to the submersible dive. The procedure for locating and identifying targets was as follows.

Firstly the submersible was released from *Borgholm* over the target co-ordinates and descended to the pinger. While its position was being fixed, it carried out a 360° horizontal sonar sweep covering a range of 250m. If no targets were registered, the submersible was guided to a second position relative to the target co-ordinates, where it carried out another 360° sonar sweep to detect the target from a different angle, while its second position was being fixed. If still no targets were seen and the target area, defined by the plotted and rechecked co-ordinates, had been satisfactorily searched from two directions, the search was terminated.

If the target location was suspected to be inaccurate, box searches were undertaken or the pipeline was followed for a relatively long distance before terminating the search. All search positions were recorded and documented with a numbered fix or fixes.

Secondly one or more targets were seen, the submersible was guided to investigate each in turn.

Thirdly on reaching a designated object which had a target number, the target was allocated a debris number. While the submersible's position was fixed, the target was recorded on video tape and still film, and a brief vocal description was given. The target was then classified as debris or rubbish, as previously defined.

Fourthly if it was classified as rubbish, the investigation of that target was then terminated. If it was classified as debris, a detailed vocal description was recorded, later to be transcribed and entered, with the debris number, on the debris list. More video and stills were taken if required and the debris was then either marked for later recovery by divers or a lifting line was attached for immediate recovery by the support vessel or later removal by a crane vessel.

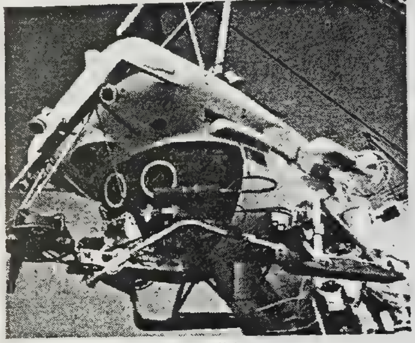
The submersible then either surfaced to be towed to its next dive position, or proceeded under its own power to the next target area, depending on the distance involved.

Any debris not included on the target list which was encountered whilst searching for designated target, was reported to the client's representative. If approved for removal, it was given a debris number and its position fixed. It too was photographed, video taped and prepared for recovery.

Retrieval procedures

Following submersible inspection of a target and its classification as debris, buoyed lift lines were deployed with pingers or attached to the debris. A selection of submersible mounted cutters, hooks, grabs and nets facilitated debris collection and removal.

Following each day's diving operations, the support vessel was manoeuvred to the floating buoys connected to each lift line, and the debris lifted on board. Occasionally, minor items of debris could be lifted to the surface by the submersible itself.



Vickers P-Class submersible.

The following is a quotation from the retrieval procedures as followed during the operations.

'Objects which led into the trench and possibly beneath the pipe were left untouched, unless it was certain that moving the object would not affect the pipe in any way.

'When debris was being lifted, great care was taken to move it away from the pipe. Final decisions concerning necessary action for removal of debris were taken by the client's representative.

The second, and more plausible reason, may be the use of different sonar systems for establishing and for locating targets. The towed side scan sonar used for target selection views the sea floor from about 20m above, and obtains reflections from topographic and sediment variations as well as from protruding objects. On the other hand, the submersible's sonar is a horizontally looking scan that only picks up signals reflected from objects rising above the seabed. It will normally neither detect variations in sediment on a plain sea floor, nor record gentle or low-amplitude topographical irregularities.

However, the 1977 retrieval operations along the **Ekofisk**-Emden pipeline proved that side scan sonar is a convenient and efficient detecting objects on the should be stressed that interpretation of good quality of utmost importance. The corre records observing the objec various sides and careful positioning the target in an accurate navigation system are also regarded as imperative to reduce the time spent in search and retrieval operations.

The attractiveness of this method is further enhanced by the cost and time economies relative to an operation relying solely on a submersible, and by the far greater area which can be covered. In addition, permanent records are produced of all observations and, as in the present survey, the sonograms may provide data for other purposes too.

'Accordingly, wires crossing the pipe or protruding from the seabed in the vicinity of the pipe were always cut prior to removal. Some wires were cut and left, and objects located beneath the pipe were not disturbed. All debris recovered was photographed and described on board.

'Upon completion of each period of field operations, the debris was brought to port and deposited for inspection by the authorities.'

Results

A detailed report was prepared, containing complete descriptions, photographs and position fixes of all sonar targets found and classed as either debris or rubbish.

The sonar targets may be separated into three classes:

- Sonar targets found and classed as debris: 57 per cent. Those removed by *Borgholm,* 52 per cent, and those removed by other vessels, 5 per cent.
- Sonar targets found and classed as litter or rubbish, 28 per cent.
- Sonar targets not located, 15 per cent.

On occasions, nothing was found which could clearly account for the side scan sonar target. Two main reasons have been suggested. Firstly, there is always some uncertainty in the position both of the submersible and of the target. However, each target has been selected on the basis of more than one sonogram. Its position was interpolated from all the available sonograms, and was believed to be known to within ±50m. It should be noted that the same Pulse-8 navigation system was used both for the submersible inspection and for the side scan sonar surveys.

The position of the submersible was determined relative to its support vessel with a claimed accuracy of approximately ±10m.

The methods used for target search were designed to take these uncertainties into account, with submersible inspection sonar covering up to a 250m range, 360° sweep from at least two locations within the target area. Further, box searches were undertaken. It seems, therefore, that the suggestion of position uncertainty is hardly likely to have applied generally.

urveying debris on the shelf

by Ole Kjølseth, A/S Geoteam

PHILLIPS Petroleum Company, Norway, which was acting on behalf of Norpipe, engaged Geoteam to resurvey the 250 mile long marine portion of the **Ekofisk** to Emden gas pipeline during the 1977 season. In addition to the actual resurvey, the scope of Geoteam's responsibilities included submersible inspection of debris items located along the pipeline route.

This article describes the methods used to identify potential debris targets, the search and location procedures, and the retrieval operations. Visual inspection and retrieval of debris items was undertaken by Fred, Olsen Oceanics employing the submersible support vessel, *Borgholm* and the one-atmosphere submersible *Pisces 10*.

Decca Pulse-8 radio navigation system was selected for the acoustic search surveys as well as for the retrieval operations. The system consisted of shore-based transmitting stations which radiated phase-coded pulse groups in precise time registration sequence at a pulse group repetition rate specific to that chain. A position line is derived from the time difference between signals received from any two stations. The position is fixed by intersection of two or more position lines.

The repeatability obtainable within the main coverage area of a chain is typically ±50m. Fixed errors are not precisely known in all areas, due to propagation conditions, but may reach a value of 200m. However, since all operations were performed in the same navigation system, these errors did not affect the work.

An AMF Sealink 301 system was used to obtain the submersible's position relative to the support vessel. This is a short baseline acoustic system which gives the distance and relative bearing from the vessel to a transponder mounted on the submersible. To position the submersible accurately, it was stopped for ten to twelve minutes while the support vessel steamed in a wide circle to change the relative bearing of the submersible. Three ranges were taken of the submersible and applied to the simultaneous geographical positions of the vessel, thereby positioning the submersible to a relative accuracy of approximately ±10m.

Preliminary target selection

The debris search and retrieval operation area was initially specified as a 100m wide strip centred on the pipeline. This was subsequently modified to include suspected major debris items lying outside this zone but within the limits imposed by interpretation of the side scan sonograms.

Initial identification of suspected debris items was made on the 200m range side scan sonograms already obtained during the resurvey for pipe exposure. Two complete profiles were available, obtained with an EG & G Mk 1B dual channel system, along each pipeline.

Additional short profiles both along and across the pipeline were run where necessary to ensure complete coverage along the 100m wide strip. In areas where the pipe trench was not visible, the pipe's position was ascertained by crossing the pipeline with a magnetometer.

A list of suspected debris items — referred to as sonar targets — was prepared from the sonograms and then compared with other sources of information concerning possible debris. These included submersible observations of debris carried out along part of the pipeline when surveying primarily for other purposes. Where appropriate, additions and modifications were then made to the sonar target list.

As a check, and to verify the positions of the sonar targets, 100m range side scan sonar profiles were run in selected areas. Normally, at least three views of each target were obtained. Particular attention was paid to targets provisionally identified as fishing nets. These were carefully checked by side scan sonar to determine if the net was hiding other debris. All the available data were then reviewed and a working list of sonar targets prepared. In addition, a tentative description of each target was assembled and its position plotted on navigation charts for use during the submersible inspection phase of the work.

Final target selection

The final selection of sonar targets to be inspected by submersible was made on board the support vessel. The selection was based on the provisional working list of targets, modified according to the following procedure which was developed in the field as a result of submersible survey experience:

- All available side scan sonar records covering the position in question were assembled and oriented relative to one another — both in time and space.
- If the side scan sonar coverage was not considered adequate, further sonograms were obtained on the 100m range. Coverage was obtained in two directions, for a distance of 100m on either side of the pipeline trench.
- Targets were then selected from the side scan sonar records and evaluated according to the following guidelines:

a. The frequency of occurrence of the same reflector on different side scan profiles, especially those run in opposite directions.
b. The relative strength of a reflector against its background.
c. The size of the reflector.
d. The presence or absence, size and clarity of the shadow area thrown by the reflector.
e. Reflector pattern or shape.
f. The proximity of the reflector to the pipeline trench.
g. The number of discreet reflectors clustered together in a small area of the seabed.

For example, strong reflectors with distinct shapes and clear shadows, identified on two or more profiles and within 100m of the trench would be designated as targets. Weak reflectors with nebulous shapes and no shadows would not be designated as targets, unless they occurred on all available profiles and close to the trench.

Each reflector was evaluated individually, and the method was found to successfully identify items as small as oil drums and rope 0.75in. in diameter.

- Once a reflector was evaluated as a target, it was given a target number and its position on each side scan sonar profile was marked with this number.
- The following details were recorded on the final target list; target number, approximate milepost location, side scan profile number, side scan profile direction, side scan profile time, tow-fish layback, offset from ship's track to target, offset from pipeline to target, and source of information.
- Target co-ordinates were calculated and plotted by the surveyor for each occurrence of the target on the various side scan sonar profiles, taking into account layback and track offset. The best mean position for the target was then calculated and plotted, and the co-ordinates entered on the target list.
- Finally, a target information sheet containing a target description and sketch was prepared, together with an interpreted photocopy of the relevant section of the best side scan sonar record. Copies of these were given to the submersible pilots, the navigation team and to the operations controller.

At the start of the submersible search and retrieval operation, the distinction between targets that were debris and required removal, and rubbish which would be left on the sea floor, was carefully defined in consultation with the client. These definitions, which were submitted to the authorities for approval, were as follows:

'Targets will be classified as *Debris*, or *Rubbish*, according to the following guidelines:

'*Debris* will consist of large wires or hawsers; steel pulley blocks; large plates or pipes; anchors or frameworks; any heavy objects such as concrete-filled oil drums; machinery parts or rails; wire loops or sharp-edged materials protruding above the seabed; and any other objects considered able to damage or

Perry Oceanographics Builds New Undersea Work System

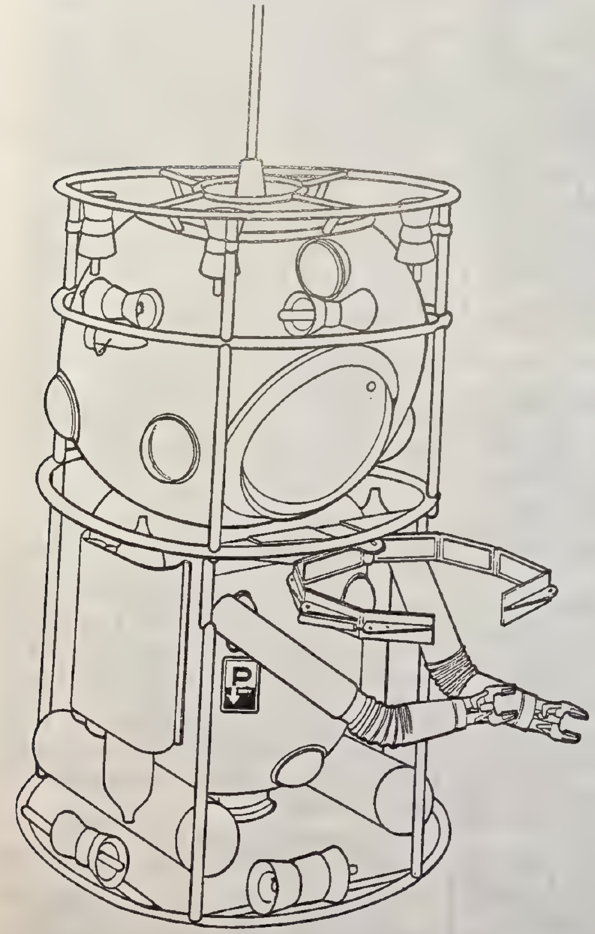
RIVIERA BEACH, FL—Perry Oceanographics, Inc., under contract to Seaforth Maritime Limited, Aberdeen, Scotland, has started the design and construction of a new concept in undersea observation, maintenance, and repair vehicle. This vehicle, a Mobile Diving Unit (MDU), is a major component of a 16-man diving complex being built by Seaforth Maritime for Occidental Petroleum (Caledonia) Ltd. Scheduled for delivery in early 1979, the system will be used aboard Occidental's semisubmersible multifunction support vessel (MSV). Diving consultants for the project are John Haynie, Inc.

The vessel will be used for deep-water maintenance tasks at the Piper and Claymore production platforms and associated pipelines in the northern North Sea.

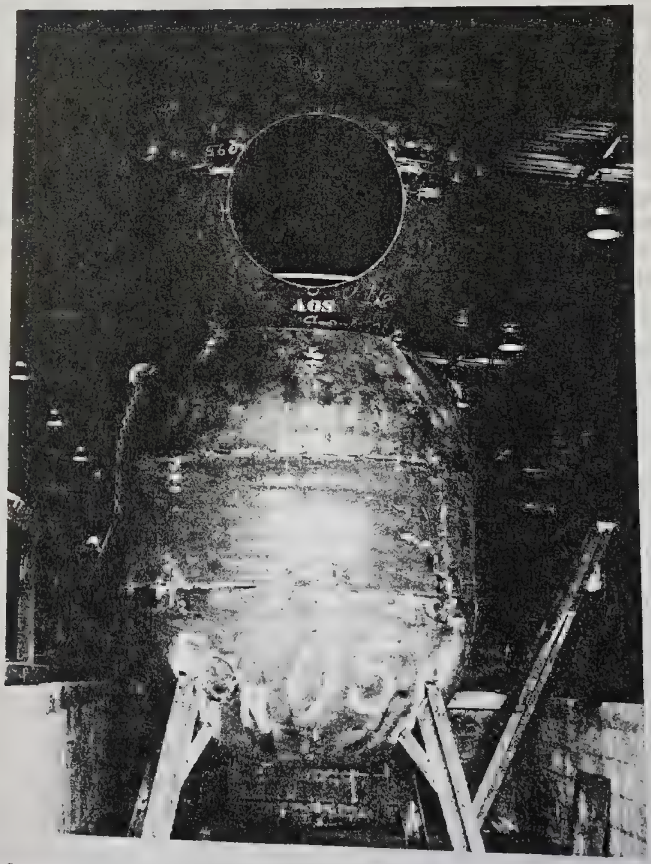
The Perry MDU, based on both diver lockout submarine and conventional diving chamber technology, will give the divers horizontal mobility, nearly unlimited electrical and hydraulic power at the work site, and a full at-site, surface-monitored instrumentation capability.

The MDU is an 18-ton, 1000-foot depth vehicle capable of maneuvering in any direction. It consists of a one-atmosphere observation chamber (AOC) and three-man submersible decompression chamber (SDC). Mounted above the SDC, the AOC affords an excellent view of the work site through a 31-inch panoramic window. The AOC contains controls, navigation, sonar, and communications systems. It also acts as the operating station for a manipulator and hydraulic tool package. The SDC is fully fitted for three divers equipped for North Sea diving. The compartments are connected by a hatch that may be opened to provide an expanded one-atmosphere work space during extended observation missions.

The MDU also has television, welding, water jet, and nondestructive testing capabilities and is designed for dry transfer to underwater welding habitats.



Mobile Diving Unit (MDU)



Standing 15 feet high, this steel mockup of the Mobile Diving Unit is used for fitting the variety of precision attachments that will comprise the final assembly.

-16-

First Operational Season for Commercial Consub

The first CONSUB 2 unmanned submersible survey and work system developed for commercial use by British Aerospace, Dynamics Group at Bristol will be used extensively in 1978 by its owners Sub Sea Surveys Limited, of Barrow-in-Furness, U.K., in maintenance and inspection work for the offshore industry.

Manufacture of the CONSUB system was completed last summer and was followed by extensive sea trials working with personnel from Sub Sea Surveys Limited. Sea Trials culminated in Sub Sea Surveys Limited using CONSUB commercially for the first time in the Autumn when a video survey of the Marathon gas pipeline running between Kinsale Head Field and the coast of Cork – a distance of 36 miles – was undertaken. The survey was successfully completed including dives of up to 24 hours duration.

Mr. Roger Chapman, Managing Director of Sub Sea Surveys Limited talking of the survey said: "The results achieved to date with CONSUB under operational conditions have excited the oil industry. The excellence of the underwater video, precise survey measurements, detailed inspection with colour video, the recovery of debris, and the production of on-line survey information on board the support vessels have proved conclusively the viability and potential of the unmanned submersible."

The complete CONSUB system includes a comprehensively equipped control cabin with separate stations for pilot and observer,an umbilical cable with greater power and digital data capacity than any other system in commercial service, a powered winch which operates under automatic or manual control and a containerised power supply cabin. Further CONSUB submersibles are in production at Bristol.

BRITISH AEROSPACE,
Dynamics Group,
Electronic & Space Systems,
GPO Box 77, Filton,
Bristol BS99 7AR, England.

Tethered Mine Counterwarfare Undersea Vehicle Developed

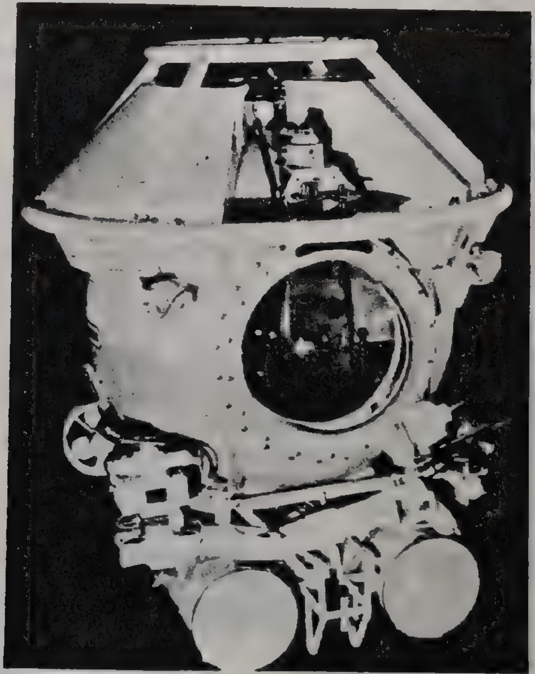
An unmanned, remote-controlled, tethered undersea vehicle which is deployed from a minesweeper has been developed at the Naval Ocean Systems Center (NOSC), San Diego, Cal.

Called the Advanced Development Model of a Mine Neutralization Vehicle System, it is used to classify and neutralize sea mines which have been detected previously by sonar. It is launched and recovered by a specially designed system. It contains its own high resolution scanning sonar and undersea television system for relocation of the target mine.

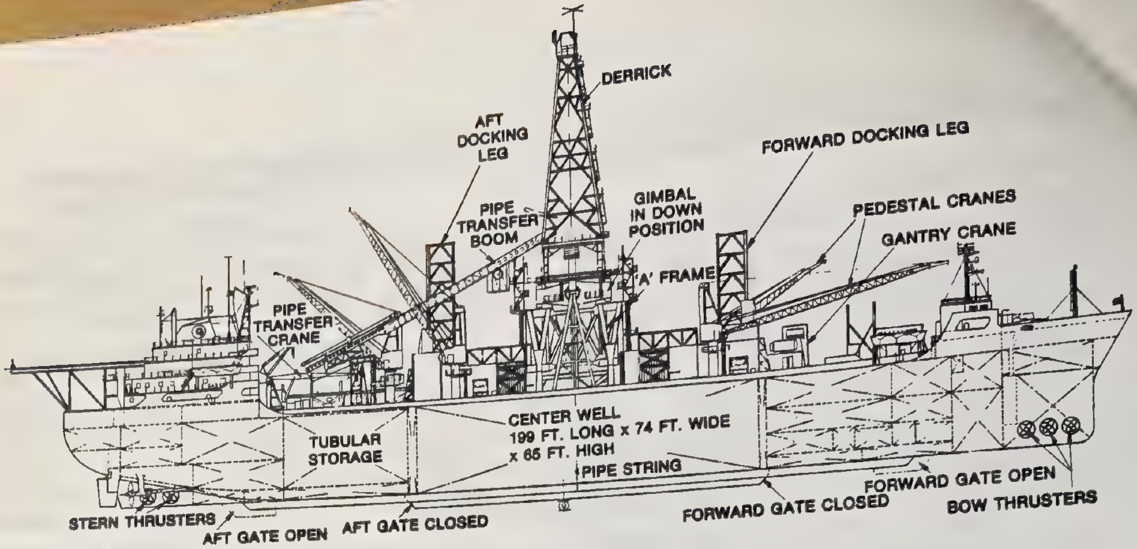
Once the classification has been effected the mine is neutralized and the vehicle is returned to the ship.

An umbilical handling system automatically stores, pays out and hauls in the vehicle's umbilical cable as the operational situation requires. Control is centered in a special control console located in the ship's Combat Information Center. A multiplex system supplies power and control to the vehicle while transmitting sensor information from the vehicle to the control console.

Oceaneering International announced that the Ocean ARMS I, a one-atmosphere diving submersible, successfully completed a record dive on August 3 off the coast of Nova Scotia. A depth of 2,842 feet was logged and certified by Lloyd's of London, establishing a new world record for a fixed buoyancy manipulator bell. Bell pilots **John Fike** and **Tom Pado** conducted a wellhead inspection at this record depth, remaining in a comfortable, one-atmosphere environment, without the need for decompression.



Ocean Arms I



GLOMAR EXPLORER — This artist's drawing points out some of the Explorer's features. Thrusters located on the bow and stern move the ship sideways and work in conjunction with the main propulsion system to keep the ship on an accurate heading during mining operations. The center well is the opening through which mining equipment is lowered on a pipe string to the ocean floor. The well is opened by two huge doors which slide open fore and aft. The pipe storage area contains the 18,000 feet of pipe which make up the pipe string. Sections of pipe are lifted from the storage area by the pipe transfer crane and placed on the pipe transfer boom for movement to the derrick. Handling equipment at the derrick erects the pipe, positions it, joins it to other sections of the pipe string, and lowers it through the center well. The gimbal system compensates for the ship's pitching, rolling, and heaving motion on ocean swells and keeps the derrick and pipe string almost motionless with respect to the ocean floor. The A frame is the structural support for the derrick. The docking legs extend down through the center well and can be used to position large work equipment beneath the ship. Pedestal and gantry cranes are used to load and unload heavy equipment.

Press tours ship

Glomar Explorer gets set for ocean mining

SAN PEDRO, Calif., — The mining ship Glomar Explorer was toured by the press here Tuesday as Ocean Minerals Company, in which LMSC is a shareholder, explained how it plans to use the ship for ocean mining.

Wearing hard hats and taking care as they scrambled up and down the ship's narrow stairways, the members of the press followed a route that went from the pipe storage handling area, to the radio and chart rooms, to the ocean mining control room, to the engine room, to the heavy lift system control room, to the manganese nodule storage area, and on to the center well, known as the "moonpool."

The Glomar Explorer has been leased for an initial 13-month period for tests which OMCO will conduct later this year to develop technology to mine manganese nodules from the deep ocean floor.

Crammed with miles of hydraulic hoses and pipes, electric motors, winches, and sophisticated control systems, the Explorer provides a stable work platform for oceanic operations such as offshore construction, oceanographic research, cable and pipe laying, deep ocean mining, and oil drilling.

In the pre-tour press briefing, OMCO President James G. Wenzel said, "When the ship puts to sea this winter, it will carry a test miner which is designed to operate at depths of 14,000 to 18,000 feet on the ocean floor to recover the manganese, nickel, copper, and cobalt-bearing nodules. The miner and the ship will be connected by more than three miles of pipe through which the nodules are pumped to the surface."

The Glomar Explorer is equipped with a gimbal system which allows the pipe string to remain almost motionless while the ship pitches, rolls, and heaves with the motion of ocean waves.

Japan to Build Unconventional Research Vessels

Kawasaki Heavy Industries and Mitsubishi Heavy Industries have been awarded a contract by the Japanese Maritime Science and Technology Center for a 25 ton deepsea research vessel capable of diving to 2,000 meters. The contract includes construction of a support ship. Delivery after sea trials is expected in October, 1981.

Japan's Science and Technology Agency has revealed plans to build a 3,000-ton semi-submersible all-weather research vessel. The ship will have a 65 by 25 m deck and speed of 15 knots. Design should be completed in 1979 and the ship is scheduled for a 1980 launch.

Another Japanese organization, the Promoting Agency for Metallic Mineral Prospecting, will build a manganese nodule prospecting ship.

Scheduled for completion in 1980, the 2,000-ton ship will have a crew of 60 and cruising range of 13,000 miles. It will operate for 250 days annually, dedicated to manganese prospecting.

LMSC to build miniature submarine for U.S. Navy

A miniature submarine designed to investigate what happens under water when modern submarines make high-speed turns and dives will soon start to take shape at LMSC, thanks to a $1.8-million U.S. Navy contract to design and build the sophisticated, unmanned craft.

The 1/12th scale model of a nuclear-powered fleet attack submarine will be able to dive to 300 feet, according to William F. Hill, program manager in 57-22.

The Control System Test Vehicle (CSTV), built of aluminum, is designed to help develop more effective control of the speedy submarines. Configuration of the CSTV can be varied to determine the effects of the changes on controllability.

In operation, the pre-programmed maneuver commands will be transmitted to the control planes (on the mini-sub's exterior) via magnetic tape through an onboard computer. How the submarine responds to the commands is then recorded and the data examined after the craft surfaces.

Hill says the 30-foot-long, 33-inch-diameter prototype craft will be built and delivered in 12 months and will be designed to dive in offshore waters. It will displace about 9,000 pounds.

The battery-powered CSTV will be able to operate for eight test cycles (each consisting of a 20-minute dive, return to surface, and idle) before the power supply needs recharging. Hill says the CSTV can be monitored and controlled from an escort vessel as a safety measure.

The craft's pressure hull will consist of four sections joined by special clamps that will permit easy access for maintenance. The forward section will consist of a free-flooding glassfiber nose dome attached to the forward main ballast tank.

The floodable aft section will be made of aluminum and contain the aft main ballast tank that also will house propulsion equipment.

Besides the operating equipment, LMSC also will design and build support equipment, such as the battery recharger, special dollies, slings and shipping containers for the air-transportable CSTV.

On the water, the craft will be towed to the test site on a high-speed sled. Home base will be the Naval Coastal Systems Center, Panama City, Florida.

Discovery Of Ship Announced

BRIDLINGTON, England (AP) — Searchers said yesterday they may have found the wreck of the Bon Homme Richard, sunk after a battle off Flamborough Head on England's northeast coast nearly 200 years ago.

The warship of John Paul Jones, father of the U.S. Navy, was a converted French merchantman. It sank Sept. 23, 1779, after a battle with the English frigate Serapis, whose captain, Sir Richard Pearson, surrendered his vessel.

Divers have been at work off the coastline in the search, financed by Clive Cussler, an American historical novelist, at a cost of more than $76,000.

Cussler's headquarters here said divers had found two wrecks and researchers believe one buried deep in North Sea silt could be the Bon Homme Richard.

Search spokesmen said further investigations are being conducted.

Submersible Follows The Pipe

Vickers Oceanics Ltd. in Edinburgh, U.K. — providing submersible services— began sea trials in June 1978 with the Scanning Sonar to survey pipeline and trench from a small submersible. The transducer is mounted in the front of the bow in continuous scanning mode. It provides profiles of trench and pipe while the sub is flying a few meters above the ocean floor. The scanning sonar head enables the sub to navigate a straight course instead of the conventional criss-cross, hit-and-miss method, increasing the surveyed length per time many-fold.

Water Fills Diving Bell; 2 Men Drown In Rescue

ABERDEEN, Scotland (AP) – Two oil workers whose diving bell broke loose from its tielines during a storm in the North Sea were killed Sunday when the bell filled with water as it was being pulled to the surface by rescue workers, officials said.

Lifelines to the bell were severed Sunday morning as the divers worked on the seabed at Mobil Oil's Beryl A platform, connecting a flow line from a satellite well about two miles away.

"The bell was lost for a time and then traced by four divers who went down in another bell," the statement said. "They got thumbs up from the two men inside to say they were alive and well."

In the rescue operation, recovery lines were attached to the stranded bell by the afternoon, and support vessels began lifting it from its bed of mud about 380 feet from the water's surface.

"As the Star Canopus lifted clear of the seabed, the bell became flooded and the recovery team found that both divers were dead on retrieval," according to a statement by Mobil North Sea Ltd., operators of the Beryl field, where the accident occurred.

Panel Urges Department On Oceans

WASHINGTON (UPI) — A government advisory committee has called for the creation of a new federal department to consolidate civilian ocean activities now scattered through "a myriad of agencies, departments and fiefdoms," it was announced yesterday.

In a report to President Carter and to leaders of Congress, the National Advisory Committee on Oceans and Atmosphere said the organizational changes would produce major long-term benefits at reasonable short-term costs.

The proposed new department would include the National Oceanic and Atmospheric Administration, the Coast Guard, the Maritime Administration and various other ocean-oriented programs now split among the departments of Commerce, Interior, Agriculture and Transportation and the Army Corps of Engineers.

In addition, the committee suggested it might also be desirable to include the National Aeronautics and Space Administration in the new oceans department. It suggested an annual budget of $3 billion, 'exclusive of NASA support.

The advisory panel, appointed by the President from outside the federal government, said that a department of natural resources now being studied by the White House would be unable to deal adequately with U.S. interests in the oceans, coastal areas, polar regions and the atmosphere and still manage land resources.

"In our opinion such a move would leave us as a nation unprepared to meet the global challenge to our national oceans and atmospheric interests that is now unfolding," the committee said in a letter dated Nov. 27 to the President.

The panel said the nation faces a variety of serious challenges to its ability to use the oceans effectively.

"As important as the oceans are to us now, we have not succeeded in developing their full economic potential, in assuring ourselves that both the regional and global aspects of environmental protection are in hand, or in acquiring the scientific understanding and advanced technology to achieve our objectives," the report said.

"Similarly, we have not succeeded in solving the foreign policy aspects of ocean affairs. Why is this?

"NACOA found a variety of answers, but at the heart of all is the fragmentation of policymaking and the scattering of ocean activities through a myriad of agencies, departments and fiefdoms."

NACOA, established by Congress in 1971, is headed by Dr. Donald L. McKernan, director of the Institute of Marine Science at the University of Washington. Its members include representatives from other academic institutions, industry, public interest groups and state and local governments.

Christmas on the Potomac

'Twas the night before Christmas and all through the House
No Congressman stirred; each was home with his spouse.
The ships were tied up in their berths without care
In hopes that St. Elmo soon would be there.
The seamen were nestled all snug in their bunks
Dreaming of tuna in great juicy chunks.
The Senate retired for winter recess
After more valiant effort accomplishing less.
When on the Potomac arose such a clatter
The news-sharks swam in to see what was the matter.
From the shallows at wharfside their eyes could behold
A Christmasea saga that now must be told.
The moon on the water was shimmering bright
To reveal to the watchers a wonderous sight.
Riding high the crest of a wave from the blue
Came a flag-adorned pinnace with eight in the crew.
A grin on the skipper, both lively and slim,
They knew in a moment it must be St. Jim.
Dressed in red, white and blue from his head to his toe,
His Pepsodent smile gleamed as white as the snow.
More playful than porpoiseful, sea solons came,
As he whistled and shouted and called them by name:
"Now, Hollings, now Rogers, now Weicker, now Maggie,
On Clairborne, on Brown, on Breaux and Murphy.
From North to South Pole, to the depths of the sea,
Stentoriously proclaim our new policy,
As galleons before the wild hurricane fly,
Let no wave of protest silence your cry."
So to the Rotunda the company flew
With a mouth full of platitudes—and St. Jimmy, too.
And then in a twinkling was heard in the dome
Wave upon wave of garrulous foam.
As they paused just for breath and were turning around
St. Jimmy leapt to the deck with a bound,
Requested permission, saluted the flag
And dumped to the deck a bulging sea bag.
From its cavernous depths, he fished out a gift
Of deregulation giving fishing a lift;
For the Merchant Marine, an edict with clout;
"Docks or no docks, three strikes and you're out;"
A license for miners of all the deep seas
To harvest and sell their rich manganese;
A turnabout face to encourage sea drilling;
Provided, of course, they avoid too much spilling,
Incentives for building new deep ocean ports
For farming and living and nautical sports;
And all the gifts added together made one—
A promise of many good sea things to come.
With his purpose fulfilled and his Sea Grants bestowed,
He boarded his pinnace before the tide flowed;
And they heard him say as he got under way,
"New maritime strength for the U.S. of A.!"

Athelstan Spilhaus

THE TITANIC

Scripps May Hunt For The Titanic

By CLIFF SMITH

Science Writer, The San Diego Union

Scripps Institution of Oceanography will apply its expertise to pinpointing the watery grave of the liner Titanic if promoters of the venture can finance it, an officer of SIO said yesterday.

The 882-foot Titanic, with 1,513 persons aboard, sank in 1912 in the Atlantic Ocean south of Newfoundland in water 2½ miles deep.

Two groups interested in filming the wreck have been in contact for many months with Dr. Fred N. Speiss, associate director of Scripps and director of its Marine Physical Laboratory, seeking his aid in the proposed project.

"It would be rather interesting thing to do, I think," Speiss said. "I'm not interested in trying to raise money for the effort. But if they get the money, we could do it."

Speiss said research has narrowed the location of the Titanic to a 20-mile circle about 95 miles south of Newfoundland.

To locate the wreck precisely, he said, SIO people would employ its so-called Deep Tow system. Deep Tow is a sophisticated sled equipped with sonar probes, cameras and mechanical arms. Towed behind a ship with a cable, the device can dive 23,000 feet deep and glide about the bottom searching for lost objects and unknown phenomena.

It was this system, in fact, that first located a strange community of large clams and other sea life at the mouth of a hot spring more than two miles beneath the Equatorial Pacific and which found ancient amphorae jars deep under the Mediterranean last summer.

In search of the Titanic, Speiss said, Deep Tow would cruise about 300 feet above the bottom at 1½ nautical miles an hour.

"Our forward-looking sonar on Deep Tow would see the wreck if it was ahead of the tow path and side-scanning radar systems would be able to detect the ship on either side out to a distance of about a half mile," Speiss said.

He estimated that there is a 95 percent likelihood that Deep Tow could precisely locate the wreck in 10 days at a cost of $800,000.

Speiss said groups eyeing the prospective expedition would film the wreck in color for a television or movie production in addition to magazines and books.

One of the expedition promotions is being spearheaded by Dr. Robert Ballard, a geologist and ocean engineer at Woods Hole Oceanographic Institution in Massachusetts, and a photographer for National Geographic Magazine.

Principals of the other search group are San Francisco promoter Spencer Sokale, 32, noted for his sale of small chunks of surplus cable from the Golden Gate Bridge as "Strands of History," and his partner Joe King.

Speiss emphasized that Scripps would join a Titanic hunt only if it was properly scientific and did not exploit the wreck in a Hollywood-type production like "Poseidon Adventure" or "Towering Inferno."

Two legitimate scientific questions about the Titantic that might be answered were identified by Speiss:

1— How much and what kind of sedimentation has taken place along the ocean floor since the sinking.

2— How has the presence of the wreck changed the character of the marine animal community in that area. New kinds of marine life develop rapidly around wrecks in near-shore areas and the same sort of thing might occur at a depth of over 12,000 feet.

"LULU and ALVIN are at the Rodman Naval Station now (Jan. 10th) preparing to depart for the Galapagos Rift about half-way between the Galapagos Islands and the South American mainland. This first leg will be for biological investigations of the hot water vents and animal life we found first time in this area a couple of years ago. Second leg will be for geology - continuation of the investigation of the rift and continental separation - Bob Ballard is chief scientist. Third leg will be chemical and physical oceanography with scientists from half a dozen universities and organizations participating. Upon completion of this third leg the Group will transit back to Panama to unload scientists and equipment and then commence the long transit to Mazatlan, Mexico to load and prepare for the East Pacific Rise dives in April and May.

Deep Sea Submersible To Be Modified Here

Manned offshore diving to a depth of 6,000 feet will be undertaken for the first time by the deep submersible Pisces IV after modifications are made at The Institute of Ocean Sciences at Pat Bay.

The alterations which will cost $179,890, will allow the institute to conduct two oceanographic programs next year at or beyond the 50-mile pacific shelf.

Cost of the work on the Pisces, which is based on the tender Pandora II, which recently returned from the Arctic is being borne jointly by the federal department of fisheries and environment, supply services and energy and mines and resources. The alterations will raise the safety factor in the case of emergency at great depth.

Head of ocean physics at the institute Dr. Pat Nasmyth said that although the vessel was tested when manufactured to simulate a dive of 6,000 feet, in practical use, the submersible has not been operated at below 2,000 feet.

If the sub descended beyond its designed capability it would mean almost certain disaster in case of emergency because changes of ballast would be required in very deep water.

Dr. Nasmyth said that theoretical collapse depth of a deep submerisble is difficult to calculate. It depends on such points of strain as hatch seams or observation port openings in the thick--walled pressure vessel where divers and controls are located.

OFFSHORE TECHNOLOGY CONFERENCE

APRIL 30-MAY 3, 1979
HOUSTON ASTRODOMAIN

Lawrence Shumaker, former manager of the *Alvin* program at the Woods Hole Oceanographic Institution, has accepted a management position with Fluor Ocean Services, Long Beach, Cal.

DDS CONSTRUCTOR has been sold to a company that is going to operate the system on the East Coast of Canada, out of Halifax.

A spokesman from International Hydrodynamics Co., Ltd. states that HYCO has gone into receivership. PISCES V and AQUARIUS I are back in Vancouver. TAURUS I is still at Vickers, but is not diving. The HUDSON HANDLER has been seized in the Gulf of Mexico.

This all paints a very dreary picture of HYCO's present fortunes, and we surely hope that all is not as bad as pictured. Let us hope that things have somehow worked out for them to get their affairs in order and continue with their business.

COMEX Industries, Marseille, France, has introduced the SM358 Lockout Submersible, a new observation and diving unit that can perform three types of missions.

It can be used for observation missions up to eight hours duration to 300m with a pilot and observer. It can conduct atmospheric transfer operations on seabed production facilities to 300m and can handle diving missions with a pilot, observer, and up to three divers for four hours bounce diving to 100m with the diving compartment pressurized or two hours saturation diving to 200m with compression onboard ship.

The submersible's top speed is three knots. The unit has a pressure-resistant hull divided into two compartments. The spherical forward compartment, kept at atmospheric pressure for the pilot and observer, contains navigation instruments and controls; the cylindro-spherical diving compartment, fully equipped with apparatus necessary for saturation and bounce diving, can be pressurized to 20 bars.

M. de Froberville left the Franch Navy in 1976 and went to work for SOGEREM in Tahiti. He is now working for the government of Tahiti and is the Chief of Planning of Development Services and also is Science and Technology Advisor.

"At the moment SDL-1 is in the last stages of a maintenance period and as such no diving has been conducted since September. In early January we will be ready to go again and we will begin trials of our new sublar (?) system as well as the new AMF submersible tracking system. This is all in preparation for our shakedown cruise in February. The details are classified at the moment but suffice it to say that it will give us all great enjoyment to be able to mark the covers with places other than Bedford Basin.

Intersub spreads its wings offshore

This year has proved to be Intersub's busiest yet. From nine submersibles and six motherships a total of 483 submersible dives — representing nearly 1800 hours diving time — have been performed in the six months to June 30. Operations have been carried out in the Middle East, Mediterranean and the North Sea.

The season so far has been characterised by a demand for submersibles as highly sophisticated data acquisition vehicles rather than as purely observation tools.

The considerable research and development instituted by Intersub in previous years has borne fruit this year.

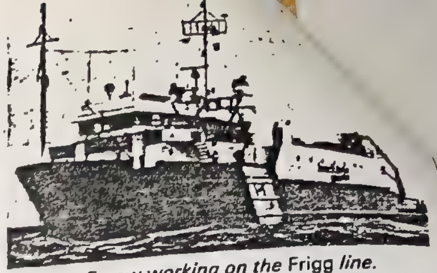
The pipelogging system has been extensively used by all submersibles; the long and short base navigation systems have been successfully applied to bathymetric survey of rough terrain in deep water — in both the Mediterranean and the North Sea.

The new current density equipment, developed by research subsidiary Intersub Development for measuring the cathodic protection of buried coated pipelines, has found immediate applications offshore.

The current density measuring equipment, used for the first time this year, is a major addition to the Intersub pipelogging system which measures pipe and trench profile and anode condition simultaneously while automatically following the pipeline. All data acquired is stored on magnetic tape and processed in the computer onboard the mothership.

While using this system in the North Sea on a pipeline close to a steel platform it was noticed that the pipeline cathodic protection potential was affected by the platform. This would indicate that the cathodic protection on the steel platform was acting with the pipeline in a previously unrecorded manner.

Intersub now have eight pipetracking systems to allow a submersible to automatically find and follow even a buried pipeline. One system has found a novel application as a guidance system on an RCV for operations with *Seaway Sandpiper* to assist operations on the Ekofisk-Emden pipeline.



Intersub 5 now working on the Frigg *line.*

Offshore operators have shown considerable interest in all cathodic protection problems this year, particularly of buried pipelines and the steel parts of concrete structures.

Current density equipment has been used as a concrete inspection aid with some success and Intersub is working on joint development with two companies to help solve the problems of concrete maintenance.

Considerable experience has also been gained of inspection, and general working, on concrete structures, including mid-water diver lock-out from **Cormorant A** and **Brent B** platforms.

For the first time this season two submersibles have been continuously operated back-to-back from one mothership. The two submersibles, *PC 1201* and *PC 1202*, have both operated from *Intersub Three*. This configuration has allowed an everage of 16 hours of submersible diving time a day to be possible on a long-term contract with Occidental.

On this contract the use of the inertial navigation system was extended from being an accurate distance measurement device, to being a navigation aid in poor visibility, during pipelaying operations.

This equipment allowed a 20m wide seabed path to be inspected for 2km in advance of pipelaying operations from *LB27* while laying an 18 inch gas gathering line between the **Frigg** gasline manifold platform, *MCP1*, to **Piper**, and **Piper** to **Tartan**. The speed of route inspection was such that it kept pace with *LB27's* daily progress.

Intersub has brought its submersible fleet up to ten this year with the purchase of three submersibles; two new ones (*PC 1205* and the diver lock-out *PC 1804*) and one bought from Comex (*PC 1203*). These additions make Intersub the world's largest commercial submersible operator.

In addition to the five company owned motherships Intersub now operates the *Protee* which has been modified to be compatible with Intersub equipment.

The rest of the 1978 season promises to be as busy as the first half, and should include operational trials of the acoustical holography and weld inspection system and a new diver heating power source. ☐

PC 1205, one of the new Intersub submersibles bringing the fleet up to ten.

CHAMBERS.
(PISCES

ADDRESS CHANGES-February, 1979

CHAMBERS, Frank J.
(PISCES IV)

RES: 1196 Highrock Ave.,
Victoria, B.C., Canada
( ) 386-9677
BUS: Fisheries & Oceans Canada
Institute of Ocean Sciences
Box 6000, Sidney, B.C., Canada
( )

MERRITT, James T.
(PC-4E,3A,8B,OP,8C,9C,
1A,1201)

RES: 815 Hawthorne Drive
Lake Park, FL 33403
( )
BUS: Perry Oceanographics, Inc.
P.O. Box 10297
Riviera Beach, FL 33404
(305) 842-5261

SANDERSON, Ian
(PISCES IV)

RES: 4152 North Road
Victoria, B.C., Canada V8Z 5H8
( ) 479-2059
BUS: Fisheries & Oceans Canada
Institute of Ocean Sciences
Box 6000, Sidney, B.C., Canada
( )

SAXON, Ross E.
LCdr, USN (Ret)
(ex-TRIESTE II)

RES: 7002 Worcester Drive
Spring, TX 77373
( )
BUS: Undersea Associates, Inc.
9800 Northwest Freeway, #205
Houston,TX 77092
(703) 682-0783

SHUMAKER, Lawrence A.
Cdr., USNR
(ex-TRIESTE,-DEEP QUEST,
-ALVIN)

RES:

BUS: Deep Oil Technology
1280 Windham Avenue
Long Beach, CA 90802

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

JUNE, 1979

Vol. XIII, No. 2 Published by the Deep Submersible Pilots Ass'n

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to;

Robert K. R. Worthington	Donald E. Saner
Editor &President, DSPA	Secretary, DSPA
3005 Curie Street	4707 Berwick Drive
San Diego, CA 92122	San Diego, CA 92101
(714) 453-1158	(714) 278-4613

Correspondence regarding new member applications should be addressed to;

Willis Forman
Membership Chairman, DSPA
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

Sorry, compadres,- this is only the second NEWSLETTER of 1979 due to a combination of circumstances which I will not recount.

Unfortunately, I did not get to OTC and have received no report on whatever happened there, The San Diego May luncheon was delayed in hopes that we would have attendees to report on events, but I was hospitalized for a tail shaft overhaul and missed the luncheon myself.

MAYDAY! Does anyone know what happened to Joe Kishel or Ross Saxon? I seem to have misplaced them somewhere. My last attempts to communicate were not returned, but neither did they elicit replies.

The ABS reply to my letter of 31 January (see Feb NEWSLETTER) is reproduced herein. It indicates a flexibility in the Rules which Doug Privitt says might exist if he could get anyone to listen!

ALVIN (on LULU) refitted at Scripps in San Diego and departed for operations on 12 June, only to experience a repetition of previous LULU engine breakdown, returning to port on 14 June, the day of this writing. The only DSPA Member presently attached to ALVIN is John Donnelly, the Program Manager. Chief Pilot is Ralph Hollis. Also piloting is George Ellis, formerly of TRIESTE. George tells me that ALVIN has made over

100 dives since May, 1978. Starting this past January, they made three legs in the Galapogos area which will be the subject of a NationalGeographic feature article this summer. There followed two legs out of Mazatlan during which even more fascinating discoveries were made, including 700° thermal vents at 2600 meters, hot enough to destroy some instrumentation. George was very enthusiastic about ALVIN's new maintenance free titanium frame. While the immediate schedule is up in the air, it is planned that ALVIN will be operating out of San Diego for the rest of the summer, departing in October for the Canal via further Galapogos ops.

SECRETARY'S REPORTS AND NOTICES

Dues for 1979--If you haven't paid your dues as indicated by an entry on your February NEWSLETTER, please remit promptly to the DSPA Secretary, Editor, or Treasurer, as convenient.

The IEEE OCEANS '79 Conference will be held at San Diego, CA, on 17-19 September. TheDSPA Annual Meeting will be held during the Conference.

The Marine Technology Society Conference on Ocean Energy will be held at New Orleans on 10-12 October, 1979. A session on Submersibles will be chaired by T. K. Treadwell (Texas A&M) and on Submersible Future Requirements by E. E. Allmendiger (U. of New Hampshire).

DSPA San Diego Luncheon Meetings

3/12/79---Met at 1145 at Tarentino's Restaurant.

Members Present	Non-Members Present
Bob Worthington	Mike Muirhead
John Cameron	Dave Mc Cafferty- Lockheed TRANSQUEST
Will Forman	Alan Smith-Lockheed Ocean Lab
Doug Privitt	Ken Privitt-MARFAB
Merle Wilson	Tod Slaughter-AUGUSTE PICCARD
Don Saner	Fred Wagner- " "
	Jack Bennett-Gulf Maritime
	Ron Rau-Lockheed DSRV

John Cameron reported that he will be relieved on 27 April and change duty from C.O. of SAN ONOFRE to Staff Com Sub Dev Gru One at San Diego.

Doug Privitt is still trying to reach agreement with ABS on his single wire electrical system.

Merle Wilson reported NEKTON, Inc.'sSEAHAVEN completed trials successfully and is awaiting her initial employment.

Tod Slaughter, Master of AUGUSTE PICCARD, reported a rough return trip to San Diego (4 days out, 7 days back) in January after commencing a run for the Canal. She in drydocked at San Diego Marine, at present.

Next luncheon will be 9 April, 1979.

9/79---Met at 1145 at Tarentino's Restaurant.

Members Present
Bob Worthington
Jerry Shiller
Don Rosencrantz
Doug Privitt
Don Saner
Jack Bennett

Non-Members Present
Craig DeWeese-MARFAB
Alan Smith- DEEP QUEST
Fred Wagner-AUGUSTE PICCARD
Tod Slaughter- " "
Tom Vetter-NEKTON, Inc.

Tom Vetter, formerly of TRIESTE, was welcomed back. He is now NEKTON Representative for the Gulf area and is based in Houston. He is applying for Membership.

Jack Bennettwas officially inducted into DSPA as an Associate Member.

Craig DeWeese, who formerly worked with Doug Privitt on the production of the NEKTON subs, is back with him at MARFAB.

The DSRV team is preparing for a practice rescue mission "fly-away" to Holy Loch.

Again, the major topic for discussion was the merits and problems of the NEKTON-type single-wire, grounded system for external, low-voltage (24 volts) equipment. Don Rosencrantz was the sole vocal opponent.

Bob Worthington read the ABS response to his letter recommending that the ABS rules provide for exceptions to be made in order to permit certification of proven systems which might be in conflict with general Rules. ABS agreed with the premise, but Doug Privitt stated that getting them to even considet a waiver seems to be impossible.

Next meeting will be 14 May, 1979.

5/18/79---Met at 1145 at Tarentino's Restaurant.

Members Present
John Cameron
Don Saner
Jerry Shiller
Don Rosencrantz
Doug Privitt
Will Forman
Jack Bennett

Non-Members Present
Alan Smith-DEEP QUEST

(list incomplete)

Jack Bennett reported that Larry Megow entertained him and Tom Vetter at lunch during the OTC. Jack said the HUDSON HANDLER was sold for $45,000 as scrap and that AQUARIUS I went to high bidder CAN-DIVE for $31,000.

REPORTS FROM MEMBERS

Larry Megow (2/9/79)
"The 1979 International Diving Symposium held in New Orleans at the Hyatt Regency on February 5,6, and 7 was a success. More than 70 exhibitors in 130 booths displayed the latest equipment for saturation diving, including saturatuin diving systems; underwater television, lights, and cameras; viewports to meet PVHO standards; nuclear voice unscramblers; cables; diver training techniques; breathing gases; pressure gauges; hydraulic operated hose storage reels; underwater cutting torches; new diving helmets, communication and entertainment boxes and hundreds of other items for safer and deeper future diving. The papers presented covered a wide range of diving activities- 'Innovation in Underwater Illumination', 'Electric Heating of Rivers', 'Lockout Submersibles' 'Underwater Non-Destructive Testing Equipmentand Techniques', 'Tethered Diver Communication System', and System for Divers in Cold Water'. It was a good show!"

Tim Askew (2/28/79)

"I thought I would drop you a line to bring you up tp date on Harbor Branch submersibles and upcoming projects planned for this year. First, we have postponed construction or JOHNSON-SEA-LINK III due to other more pressing commitments such as updating SEA-LINK I and II from their present 1000 ft. depth to 2000 ft. In May, we will be recovering and developing another COSMIC package as part of a continuing joint physics project with NOAA. Later in the year , we hope to move our dry transfer chamber from 1018 ft. to 1500 ft. or deeper. Also, we are planning to be on the MONITOR wreck site for the month of August. We will be doing 30+ lock-dives for selective artifact recovery. This is a joint operation with NOAA, the State of North Carolina, and Harbor Branch. All of our dives will be HE/O_2 as the depth is 220 ft. This is our second trip to the site. The first time , we did a photogrammetric survey of the wreck for NOAA in August , 1977. These are special projects and are done along eith our own continuing sciende programs. I hope this information will be of interest to other members of DSPA. It doesn't look like I will be able to attend OTC '79; but our Operations Director, Roger Cook, will be there and may be able to sit in on the meeting on May 2. One last note, and that is concerning the NEKTON controversy, I do not profess to be pro or con as I am not familiar with the system on an intimate basis. However, my concern would not be in getting shocked but a possible through -hull penetrator failure. If a direct short was to develop in the penetrator itself, it could cause a catastrophic failure of the penetrator, necessitating emergency pressurization and surfacing."

Kevin Parker (3/1/79)

"Thanks for the addresses regarding possible employment in an American company. If things go well in the next few days I should be working again for a company over here. Just now I'm not at liberty to say who; but, as soon as something happens, I will let you know. I have read with interest the 'debate' over the single-wire NEKTON sustem. I have found that both arguments hold water (sorry about that!) I suppose that NEKTON's record proves its own side of the story, but it can be seen that any deviation from stringent maintenance could result serious trouble. It would seem to point to a high maintenance disipline amongst NEKTON's crews. I had hoped to re-open the case of badges, but I can't trace the company who made the originals. I seem to remember sending the address to the DSPA. If you can find it and send it back, I will speak to them again. I'll be in touch again as soon as anything happens that is worth writing about."

Bob Starr (3/6/79)

"My title is Manager of Operations for the Technical Services Group of Martech International. We operate the Remote Controlled Vehicles, Submersibles, Acoustic Systems, and Bell and Sat Systems. These systems are spread out all over the world, particularly in S.E. Asia and Brazil. I also enclosed a picture of the PIONEER I and some photos of our handling system.--The commercial submersible market in the Gulf of Mexico is very depressed due largely to the introduction of the Remote Vehicles which are without a doubt more efficient, even though it hurts like hell to say that. I'd like nothing better than if they were never invented, but they do work very well and are getting better by the minute;and submersibles, for all practical purposes, have not changed except in the case of the lock-out boats.--I would like to make a comment concerning the NEKTON electrical system controversy, even though I have not talked to anyone concerned, only read what you have printed. I've known Merle for a long time and , although he is an unusual individual and I think the world of him, he is very safety conscious in his own way and , if he says he has no problems arising over the years, then he has had no problems. In addition, I checked with some Corrosion Engineers, as we are getting into this area in a big way, and they have told me that they can prove that there either is or is not a prob=lem as the state of the art is not there yet, moreover strengthening Merle's case. The only area where there appears to be some question is on what current flow is safe regarding the human body. In a totally grounded system, i.e., 50 v RMS and 8600 ohms, a current of 8 milliamps is possible. It is a fact that much of industry considers 5 milliamps or more to be lethal to some individuals. I'm sure Merle is aware of this."

Kirk Newell (3/8/79)

"Among other things, I now have South Central Bell Telephone Co. Headquarters responsibility for Mobile and Maritime Radio Systems Engineering in our five state area."

Bob Rees (4/1/79)

"This will be mailed from Pattaya Beach, Thailand, in about a week. The good ship GRAYBACK is making a port call there then.--I have orders to COMSUBDEVGRU ONE and expect to get there late August. My family and I are looking forwardto being back in the U.S. again"

Olivier Bouet-Willaumez (4/1/79)

"I'll send you this word from Port Moody, near Vancouver, B.C., where ISE is located. We have just received from ISE the TROV 58, an unmanned sub (5,000 lbs., Max depth 3000'). This is the first unmanned vehicle for Intersub which owns ten manned subs mow. We've performed a lot of tests and sea trials, very successful, on the B.C. waters.

The vehicle looks very reliable and powerful, and so I'm going to sign the acceptance tomorrow after two and a half months here, --Within the next month, TROV 58 has to be fully equipped with a lot of very sophisticated equipment and made ready for the offshore job. The mothership is INTERSUB FIVE with new facility, DP sustem, and PC 1203 on board.--But, compared to the manned submarinejob, it's another world, another feeling...very interesting, anyway."

Ray Toler (5/5/79)

"I am still here in Charleston and retired from the Navy. I sure do enjoy the NEWSLETTERS and I hope you will keep them coming. There is not much here for deep submergence, and the NEWSLETTER keeps me posted on what is going on. I was happy to hear the DEEP QUEST was back in service. I sure do miss the deep submergence business. If you hear of any job openings, let me know. Best of luck to all!"

Alan Whitfield (5/11/79)

Enclosed is the April edition of the I.U.P.A. NEWSLETTER. It should help to clear up some of the mystery over Vickers Oceanics.--I have recently been involved with an underwater habitat, now being built in England, Called the MINITAT. (More details later). However, I am now looking for a change of scenery and would be interested in joining an organization in your part of the world which is looking for a experienced pilot. Perhaps you would be kind enough to pass my name and address to such an organization.--The I.U.P.a. has been approached by the Society for Underwater Technology in London to arrange a one-day seminar on 12 February, 1980. The subject is "Operational Safety of Manned Submersibles". I would like to involve the DSPA. Therefore, do you know of an experienced DSPA member who would be interested in speaking? His talk would be along the lines,"Safety,My Personal Experiences While Piloting".

Tim Askew (5/10/79)

"During our recent training cruise in the Bahamas, we experienced a shark attack on one of our submersibles,JOHNSON-SEA-LINK II. The incident happened on Dive No. 399 which was a test of our recovery reel (a device which enables us to recover large objects on the bottom by attaching a line to it and blowing the reel to the surface for recovery by the surface ship) in 1040 feet of water. The pilot and observer (Tim Askew and William Bond) reported seeing a school of sharks (unidentified species) of 50 to 100 and ranging in size from 6 to 12 feet. The school was observed at 500 feet during our descent to 1000 feet off Cross Bay, West End, Grand Bahama Island. After reaching the bottom, a shark was seen circling the sub several times. All of a sudden, we felt a hard bump on the starboard side of the sub. At the same instant, I heard a metallic ringing sound in the underwater telephone and I immediately secured the starboard lower thruster which was the only one running at the time. We continued with our mission; and, after recovery by R/V JOHNSON, the sub's mother vessel, we proceeded to repair the Kort nozzle (made of syntactic material painted bright yellow with a white propeller) that the propeller was rubbing on. It was at this time that we discovered a large crack on one side of the nozzle and a nice set of teeth marks on the other side. It appeared that the shark had tried to take a bite right out of the thruster."

American Bureau of Shipping
Sixty-five Broadway
New York, N. Y. 10006

Refer to: JWR/pb
File Ref: T-16

8 March 1979

Rules for Building & Classing
Underwater Systems & Vehicles

Deep Submersible Pilots Association
3005 Curie Street
San Diego, CA 92122

Gentlemen:

Attn: Mr. Robert K. R. Worthington,
Captain U.S.N. (Ret.)
President - Deep Submersible Pilots Assn.

We have your letter of 31 January 1979 which urges that this Bureau provide for carefully considered acceptance of exceptions to the Rules affecting classification of manned submersible vehicles.

The new Rules for Building and Classing Underwater Systems and Vehicles have been approved by the Technical Committee and publication is expected in May of this year.

While the Rules are specific, as with all Rules of this Bureau, it must be emphasized that the Rules are not intended to hamper designers and new developments. The Bureau remains prepared to consider alternative arrangements which can be shown to meet the overall safety standards of the Rules. This concept is considered of such importance that, as you suggest, it has been explicitly stated within the Rules.

We are continually reviewing the Rules as more experience in their application is acquired. We appreciate your interest.

Yours very truly,

AMERICAN BUREAU OF SHIPPING

W. M. HANNAN
Vice President

by J M Russen
J. M. Russen
Asst. Chief Surveyor - Machinery

TELEPHONE: 212-440-0300 CABLE ADDRESS "RECORD" TWX: 710-581-3089 TELEX: ITT 421966 RCA 232099 WUI 620353

This month

At a time when many offshore operators in UK waters appear to have found the golden fleece, companies offering the services of manned submersibles for inspection and construction work caught only a glimpse of it before, for them, it turned to dross.

A definite trend has developed, where there are too many submersible-operating companies chasing too few contracts – the end product being that two of these companies have wound up their UK operations completely, and another has trimmed its workforce in order to stay competitive.

Like the waters of the North Sea itself, the companies have found the going extremely rough. P&O Subsea and Comex UK submersibles fleets have disappeared from the scene completely, and the Vickers Oceanics (VOL) staff level has been cut by a quarter this month.

VOL has been worried for some time by the downward spiral in the number of underwater inspection and construction jobs coming its way. The lack of work has resulted in half-yearly figures for Vickers Offshore Engineering Group (of which VOL is a part) showing a heavy £3 million loss, most of which can be laid, according to reports, at VOL's door.

'Streamlining the companies operations' is the euphemistic phraseology being applied by Vickers to the procedure of putting people out of work. The official figure made redundant in the Vickers Offshore Engineering Group as a whole is 68, while unofficial estimates are closer to 80.

At VOL's Leith base, 35 people have officially lost their jobs, while Underwater Pipeline Engineers (UPE), a part of the VOL set-up based at Barrow-in-Furness, has lost 18 personnel; a further 15 have been made redundant at the project and development base at Barrow.

Vickers says alternative employment has been offered to those personnel who wanted to stay with Vickers, in other parts of the organisation, but it appears that few have taken up the offer, and redundancy payments have totalled around £150,000 – around £2,000 per person on average, if the official figure of 68 people sacked is correct.

A Vickers Oceanics submersible swings into action, but for the company the action has been slowing down and a quarter of its operating staff have been made redundant.

The fall-off in demand for the services of submersible-operating companies is summed-up by Jack Rorke, managing director of Vickers Offshore. In a recent interview with *Offshore Engineer*, he said: 'The workload in the industry is not as good as it has been in previous years, and it does not look as though there will be enough work next year for the ships we've got.

'The continuing international trend for submersible fleets appears to be falling off despite a marketing drive both in the UK and overseas.'

As a consequence, Vickers has reduced its workforce to 'get it moving again in the right direction', and to 'protect its competitive position.' Rorke is confident the change will give Vickers the right kind of boost to enable it to collect some 'good business in the future.'

He was, however, non-committal on whether the fleet of five submersible support ships would remain unaltered, or whether it would be cut to three as has been rumoured in the industry.

He did confirm, though, that a bid had been put in for a long term contract for one of the ships to work offshore India on the Bombay High field, and did not deny that that ship could be the *Vickers Viscount*.

The future trend for Vickers Offshore in general is to concentrate on intensive research and development work, especially concerning submersibles and associated systems like the neutrabaric one-atmosphere wet encapsulated well- developed at Vickers Intertek Liverpool, although most of the work is to be carried out at the Kirby Moorside base in Yorkshire.

P&O Subsea and Comex have found they could not compete in the submersibles market, and both wound up their respective operations in the early part of the year. P&O is still looking for a buyer for its four submersibles and two mother ships, whereas Comex sold its *PC 1203* Perry submersible to Intersub for around £325,000, with Intersub also taking over the part of the joint venture Comex had in operating the support ship *Protee*.

The submersibles companies are not the only ones having problems finding work. Some underwater engineering concerns are equally plagued by the fall-off.

One in particular, CxJB Underwater Engineers, has found its services difficult to sell since several specialised personnel left the company earlier this year. It is not likely that the company will be wound up altogether, but there is a general feeling in the industry that it could lose the support of Comex Diving (a separate branch of the Comex group from Comex submersibles) and eventually find itself being absorbed by CJB Earl & Wright, its other parent company.

Charles Band, the present CxJB managing director, however, says that, although there is a possibility that the company will become more closely associated with CJB Earl&Wright, he is confident the Comex support will remain. He sees the company actually expanding in the next few years to a peak of having 35 engineers working in the field as opposed to the present 10.

Underwater work in general seems to be going through a dull patch, although this is not the sole reason for the lack of profitability and windings-up of submersible companies. Such companies need on average to work each of their ships about 220 days per year to make the operations pay.

The criticism now, from those companies still operating in the North Sea sector, is directed at the oil companies. Unless they agree to higher rates for the job even if the work is available, there could be more companies burying their submersibles in the graveyard of bankruptcy.

Good year for Sub Sea

SUB SEA Surveys, operators of large remote controlled survey and inspection submersibles, is pleased with its success in the 1978 season.

Operations again centred around the use of Sub Sea Surveys' *Consub 2* which has been working almost continuously since mid April 1978 under contract to oil companies in the North Sea. Each job has been carried out successfully, work rates and results have achieved and surpassed the expectations of both client and Sub Sea Surveys, says Roger Chapman of SSS.

Pipeline runs

The 1978 season for SSS included:

Early May 1978: Pipeline inspection and site surveys involving precise bathymetric measurements of the seabed.

Mid May 1978: Pre route survey of a subsea pipe route, involving the full survey capability of *Consub 2* using side scan sonar, bathymetry, video, stills and other sensors in defining the pipe route.

Total success achieved with extended dives in excess of 24 hours duration. In addition to RCV work with *Consub 2*, further results were obtained involving shallow seismic work (6m cores) and other conventional survey tasks.

June 1978: Site investigation work in the Norwegian sector involving detailed visual inspection of 11 drill sites, including full video and still photo coverage, side scan sonar surveys and debris recovery operations.

This work initially scheduled to take at least 45 days, was completed in less than 30 days due to the high work rate of the Sub Sea Surveys/*Consub 2* spread.

July, August, September 1978: The '**Big One**'. A complete pipeline inspection task undertaken under the most stringent conditions involving high work rates, detailed video investigations, colour still photography, high resolution profiles, and other measurements.

The contract, initially for 60 days was extended by the client who throughout the whole job demanded a very high standard of results.

October 1978: Trials commissioned by a Norwegian oil company for a future high resolution profile task in Norwegian waters — winter work.

November 1978: Operations on the above task.

December 1978: Demanding cleaning and inspection task on a complex structure in the Norwegian sector using the *Spider* remote controlled vehicle, in conjunction with Myren Verksted of Norway.

Says Chapman:

'Sub Sea Surveys Ltd with its own remote controlled vehicle *Consub 2*, and by sub-contracting other RCV's (i.e. the Myren *Spider)* is now making real progress in establishing the RCV as a cost effective, safe and valuable system for underwater work'.

Sub Sea Surveys' approach is to evaluate carefully the task to be undertaken, and to recommend and configure the right RCV for the task.

With this in mind in addition to the above extensive operational programme, Sub Sea Surveys has designed and built from scratch a small, highly mobile RCV called IZE.

This is the first remote controlled vehicle that has been totally designed and built by a specialised RCV operating company.

The company carefully examined many available devices but were unable to find one to meet the exacting requirements and at the right price.

Based around a tough monocoque frame, the vehicle has an aluminium base of water blocked tubing. Dual purpose cylinders provide buoyancy and house the electronics systems. Only 30 per cent of the available space will be used, leaving 70 per cent for additional sensors, if required.

Sub Sea Surveys is also involved in consultancy projects concerning positioning and RCV work, and is thus keeping an eye on all future developments.

Some misgiving over merger of underwater companies

Sub Sea International, Strongwork Diving and Sonarmarine have been reorganised by their parent companies to form one underwater engineering and surveying company, Sub Sea Offshore.

The new company, like SSI, is owned by BP and ODECO on a 50-50 basis. Strongwork Diving and Sonarmarine were previously both 100% BP-owned.

The move has angered some British executives within the group who believe the deal was mishandled by BP and is a sell-out to American ODECO.

UK-Norway rcv link-up

An important Anglo-Norwegian business link-up was forged in February with the formation of Subtek to operate remote-controlled submersibles in the Norwegian sector of the North Sea. Three companies are involved equally – Norway's Myrens Verksted and Simrad, and SubSea Surveys of the UK.

SubSea Surveys has already achieved a reputation as operator of *Consub II*, with work including the North Sea Flags line survey for Shell-Esso last summer. It has also used the underwater 'work-horse' *Spider*, manufactured by Myren.

Myren's subsea developments include *Snurre*, another vessel which has worked extensively in the Norwegian sector. A Mark 2 version, now under development, will include Simrad electronics equipment.

Oceaneering hopes to take delivery of two glass reinforced plastic SAM one atmosphere diving suits from UMEL of Farnborough in April. The suits will have a depth capability of 2,000 feet compared with 1,000 and 1,500 feet for the earlier magnesium alloy versions. The suits will use the same arms and legs as the JIM suits already in service of which there are eleven (as well as one in the British Science Museum). Two SAM suits, a smaller and lighter suit than the JIMs, are currently being used for training and evaluation and have a depth capability of 750 feet

UK government studies deep water work systems

Aberdeen — A high level scientific committee is starting work on the definition of diverless systems for deep water work. Under the guidance of Department of Energy chief scientist Sir Hermann Bondi, the committee is calling on the expertise of defence and aerospace scientists as well as offshore contractors to thrash out the design of equipment which British industry might develop to replace divers in conventional water depth down to 1000 feet and in the continental slope and deep ocean where exploration is now turning fast.

Wharton Williams managing director Ric Wharton, who is taking part in the so-called Bondi Initiative, explained to the Aberdeen AODC conference last week that "exposing divers to risk is going to become socially unacceptable." But Wharton suggested that the study would neither eliminate the need for divers nor bring fast changes. He considered that the way towards definition on an unmanned remotely controlled vehicle for the future would have to be through extensive field experience of intermediate systems such as the manned one atmosphere work systems. Oceaneering's SAM, JIM and WASP units are among these interim designs as are Star Offshore's MANTIS vehicle and the Spider developed by Wharton Williams.

UKOOA backing? The refinement of both manned and unmanned underwater vehicles is likely to involve more oil company money in the future, conference delegates suggested. British Petroleum's group diving officer Pat Dowland responded to an appeal for help with funding new vehicle development by saying that "I hope the UKOOA (United Kingdom Offshore Operators Association) committee concerned would look at that. It might well be a topic for discussion at one of our upcoming meetings," he speculated, although warning that any support for more involvement might be "only loosely stated." Dowland added, "But action has got to come from somewhere and perhaps the lead should come from us," he concluded.

Right now, Wharton explained, development funds of probably well over £500,000 for a single vehicle have to come from the limited funds of small offshore contracotrs. Some of them cannot afford to keep develoment going and one of the first companies in the unmanned vehicle business with a very advanced model now partly completed was forced to appoint a receiver recently (see EOPN 13/79, March 28, page 7).

OSO research work The Offshore Supplies Office is also reported to be carrying out a market survey for underwater intervention vehicles. But rapidly changing views among the oil companies and the certifying bodies towards greater use of unmanned vehicles combined with a proliferation of new equipment in the market means that any study will soon be out of date. "Any survey is going to be unreliable," Wharton claimed, "but it is inevitable that the search (for oil) will go to deeper water and we must be ready for it."

A-12 THE SAN DIEGO UNION Sunday, June 10, 1979

Mexico Calls Adair To Cap Oil Spill

MEXICO CITY (UPI) — Famed oil well firefighter Red Adair has been called in by the government oil monopoly, Petroleos Mexicanos (PEMEX), for aid in capping the burning oil geyser shooting up from the depths of the Gulf of Mexico, Adair's office in Houston said yesterday.

PEMEX confirmed the report that Adair was in Mexico but refused to say whether he was working on the underwater gusher, which is spewing up to 45,000 barrels of oil a day.

Sources in Campeche, the city closest to the PEMEX Ixtoc I well that ran out of control after an explosion and fire in the Bay of Campeche last Sunday, said PEMEX had tried but failed to deploy a containment boom around the spill.

They said PEMEX had sent for a diving bell and a three-man submarine, probably from the United States, so that divers could try to close a valve at the base of the gusher 150 feet beneath the surface.

PEMEX officials in Mexico City said Mexican divers tried to approach the valve Friday in "near zero visibility" but were driven back by the rush of the oil boiling to the surface.

Shrimp boat captains in the Bay of Campeche complained PEMEX was not giving them the full story on the size of the oil spill. In Carmen, home port of Mexico's $110 million-a-year shrimping industry, boat captains demanded PEMEX give them "the true facts" and complained the oil finds in Campeche were putting their jobs and the industry in danger.

There were conflicting reports on the size of the slick spreading out from the Ixtoc well, 48 miles northwest of Carmen and 500 miles southeast of Mexico City.

PEMEX Campeche area manager Genaro Andrew Gonzalez yesterday told reporters in Campeche that the slick was about 60 miles long.

One boat captain who cruised the area said the spill covered about six square miles. Airplane pilots said it was 70 to 100 miles long and 10 to 40 miles wide.

A PEMEX official said it was three miles long, but when asked whether that was the length or width, he added, "I don't know. I just hope it isn't depth."

PEMEX said the well produces 30,000 to 45,000 barrels of oil a day. At 30,000 barrels a day it would be worth $513,000 at $17.10 per barrel.

National Enterprise Board buys into Vickers assets

Britain's youthful National Enterprise Board took its first financial plunge into the offshore industry in late March. By acquiring assets in the ailing Vickers Offshore Engineering Group, the NEB, Brown & Root (UK) and Aberdeen's Wharton Williams have set up a new group called British Underwater Engineering.

The NEB's share is initially 89%, Brown & Root's 10%, Wharton & Williams's 1%. It is understood that the share ratios will change in the future, with 2W and B&R each to take 24.5%. Shareholders' power will still remain in British hands, says NEB divisional director Nick Barber, because B&R's stake will never rise to more than the 24.5%.

Chairman of the new BUE will be Rick Wharton, currently managing director of the company that he partners with Malcolm Williams. 'The new company's early days will be tough,' he says. 'The North Sea market offshore will not go through a healthy period for the next two years.'

Buying assets cost the new partners £6 million. On the personnel front the very successful Vickers Slingsby group has been acquired, lock, stock and barrel, but will operate as an autonomous group under BUE's direction. It will continue to specialise in grp technology and manufacture of underwater vehicles. The 300 staff will remain.

BUE will also buy Vickers' fleet of nine submersibles and five mother ships. Some will be sold abroad, because of the tight North Sea market.

More speculative is the future of Vickers Intertek and Vickers Underwater Pipeline Engineering. Barber mentions that their role is under negotiation. Both groups are still trading. *OE* sources, not the NEB, have suggested the UK's Weldit as one possible taker for VUPE.

The total new staff of BUE will be more than 400, with over 100 in Aberdeen.

The whole move by NEB is a sign of its new British aggression to the offshore industry. It approached Wharton & Williams in the first place when Vickers' financial problems came to light early this year. The board has also set up a new deputy divisional director, Roger Kendrick, specifically for offshore engineering.

Christmas Day 'A' frame collapse traps six on seabed

(O.E. JAN. 1979.)

Two underwater engineers narrowly escaped in what could have been the second fatal diving accident in two months when their submersible plunged unrestrained 135m to the seabed on Christmas Day.

The men were being lowered from the diving support ship *Intersub 4* in a *PC1203* submersible to work on the Ninian field when the launch mechanism disintegrated and the submersible dropped into the water. The 'A' frame fell away from the ship on top of the submersible slightly damaging it.

After a hard landing on the seabed, the submersible was found not to be badly damaged, and the men shaken, but unhurt. It was not at first possible to bring the submersible back to the surface because the 'A' frame had pinned it to the seabed.

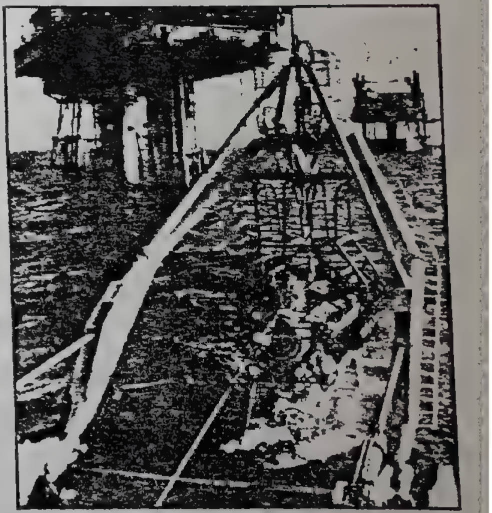
The men spent six hours on the seabed while the *Seaway Swan* was brought in to retrieve the vehicle. As the submersible's support system was undamaged, and the men had several days of rations, they were in no immediate danger, but the accident cannot have done a great deal to strengthen the confidence in the equipment used in the operation.

Primary cause of the accident was a broken weld on one of the launch system rams, which resulted in a chain-reaction throughout the mechanism, causing it to fail completely.

Intersub says the ships are inspected at least once a year, but after this mishap all its ships are to be closely examined for structural defects. *Intersub 4* has been operating for three seasons, and has frequently lifted and launched heavier submersibles than the 8t *PC1203*.

Intersub had been contracted by Chevron to inspect a pipeline 1,500m south-south-west of Ninian Central platform, and the submersible was being launched in sea state five when the accident happened.

Because the accident has ramifications in other sectors of the offshore industry, a full inquiry is being conducted by the Offshore Supplies Office and the companies involved.



The 'A' frame of an Intersub diving support ship which fell on top of the submersible during the launch after a ram weld shattered.

INTERSUB in 1978...

- North Sea, Mediterranean, Middle East, INTERSUB operates round the world.
- 3 new submersibles, PC-1203, 1205 and 1804.
- 1000 submersible dives.
- 700 kms. of pipeline inspected and fully documented.
- Major technological breakthrough in diver heating.

INTERSUB operated six support ships and nine submersibles this year completing in the order of 1000 submersible dives. The INTERSUB computerised pipeline inspection system covered over 700 kms. of buried and unburied pipeline providing full documentation for future reference.

The commissioning of the advanced diver heating system means longer and safer diver lockout operations as this system, based on the latent heat of fusion of salt, is independent of the submersible battery.

INTERSUB FIVE is being converted to support both a TROV unmanned vehicle and a manned submersible. The support ship will be fitted with a full INTERSUB computerised submersible navigation system so that, in conjunction with TROV and a manned submersible, a complete pipe inspection can be undertaken in a really cost effective framework. The system will be available early in 1979 when the TROV is delivered.

Of special interest this month is a letter from Mr. David G. Doman, Vice President of HYCO. So we will start off right away with Mr. Doman's news.

He states that there has indeed been a slowdown in the demand for new manned submersibles which has led to financial problems for the company, but they are continuing their manufacturing activities. They are at present in the final assembly stages of constructing two unmanned tethered craft for the U.S. space agency NASA. These special purpose vehicles are designed to recover from the ocean the spent solid rocket boosters used by the space shuttle. Another major project is the modification of PISCES IV.

unmanned submersibles

Vehicle	Manufacture	Number Built	Depth	Function
Recorp MKV-A	Smit-Lecler Harvey, LA	1	915m	Inspection
Scarab	AMETEK, Straza Division El Cajon, CA	2	1830m	Inspection and work (2 manipulators)
Scorpio	AMETEK, Straza Division El Cajon, CA	6	915m	Inspection and work (1 manipulator)
Seaspy	Underwater & Marine Equipment, Ltd. Farnborough, UK	1	305m	Inspection
Snurre	Continental Shelf Institute Trondheim, Norway	1	600m	Inspection
Telesub 1000	Remote Ocean Systems Escondido, CA	1	500m	Inspection
Tom-300	Thompson-CSF Omano, France	1	300m	Inspection and work (1 manipulator)
Trec	International Submarine Engineering, Ltd. Port Moody, BC	1+3	365m	Inspection
TROV	International Submarine Engineering, Ltd. Port Moody, BC	1+5	365m	Inspection and work (2 manipulators)
UFO-300	Winn Technology Ltd. Kilbrittain, Ireland	1	300m	Inspection
Boctopus	BOC Ltd. London, UK	1	660m	Inspection
Cetus (TROV Copy)	ULS Marine, Ltd. Stonehouse, UK	1	460m	Inspection and work (2 manipulators)
Consub-2	British Aerospace, Bristol, UK	3	600m	Inspection and work (1 manipulator)
Filippo	Guido Gay, Naviglio, Italy	1	300m	Inspection
Orca (formerly SAAB-SUB)	SAAB-SCANIA Linkoping, Sweden	1	700m	Inspection and work (3 manipulators)
RCV-225	Hydro Products San Diego, CA	24	400m	Inspection
RCV-150	Hydro Products San Diego, CA	6	750m	Inspection and work (1 manipulator)
Recon-II	Perry Oceanographics, Inc. Lake Park, FL	1	460m	Inspection and work
Recon-III	Perry Oceanographics, Inc. Lake Park, FL	2	366m	Inspection
Recon-IV	Perry Oceanographics, Inc. Lake Park, FL	1	365m	Inspection and work (1 manipulator)

Giant of the Galapagos Rift

Two years ago, researchers found a rich and unusual harvest of sea life clustered near the 9,000-foot-deep hot-water vents of the actively spreading Galapagos Rift (SN: 3/19/77, p. 182). This year, the research submarine *Alvin* again dove to the rift, located 500 miles west of Ecuador, and pulled out another plum: an 8-and-a-half-foot-long sea worm. The worm, pictured with a crew member from Woods Hole Oceanographic Institution, is the largest creature yet recovered from the area; it is a giant version of the 12-inch specimens collected earlier (SN: 4/30/77, p. 279).

The worm is pink with a reddish tip and lives attached to the ocean bottom in a tough, protective tube that is slightly longer than its body. It has no eyes, no mouth and no gut; expedition biologist Frederick Grassle of Woods Hole says it probably absorbs nutrients directly from the ocean. It is also the third known example of animals that are thought by some biologists to comprise a new phylum. The grouping, called Vestimentifera, is related to segmented worms, the phylum Annelida. But these worms are enough unlike the annelids for biologists such as Smithsonian Institution's Meredith L. Jones, who will be examining the giant worm, to assert that Vestimentifera is a separate phylum. ☐

"Taylor Diving & Salvage Company has been utilizing RCV-225 Remote Controlled Vehicles for over two years. Since that time customer acceptance and utilization has been instrumental in Taylor becoming the world's largest owner/operator of these systems with an inventory of seven. Our personnel and systems have amassed thousands of operational in water hours on such diverse operations as setting offshore platforms; observation of anode installation; pipeline inspections: monitoring hyperbaric welding, and observation of the installation of subsea wellhead completions in depths ranging from 450' to 1050'. Taylor's RCV systems are deployed in such distant areas as the North Sea, South Pacific offshore New Zealand, and the Gulf of Mexico.

During the forthcoming season, we anticipate contracts for all our systems. Additionally, we have been contracted by Shell/BP/Todd for work on the Maui A Platform in New Zealand since December 1977. The present contract expires in November 1979, which will make this the longest ongoing RCV contract in the industry."

Harbor Branch Foundation (operators of the JOHNSON SEA LINK submersibles) and NOAA have entered into an agreement that calls for Harbor Branch researchers to conduct more than 30 dives on the wreck of the Civil War ironclad USS MONITOR this August.

The expedition, expected to last almost 3 weeks, will concentrate some of the most sophisticated diving and underwater archaeological equipment ever used on any wreck in U.S. waters.

Since its discovery in 1973, the MONITOR, lying in 210' of water some 16 miles off Cape Hatteras, N.C., has been an object of scientific and public fascination that may turn out to rival its Civil War popularity. In 1975, under NOAA's aegis, it became the site of the nation's first federal marine sanctuary. Only one other area in the U.S., John Pennekamp State Park, Key Largo, FL, enjoys the same status.

To date, the most useful photographs of the MONITOR were taken in August 1977 during another Harbor Branch-NOAA operation. These photographs show the wreck lying upside down, with its famous "cheesebox" armored turret detached and half buried in the Atlantic sand.

At the present time, only 2 artifacts have been recovered, both from the 1977 expedition: a 65 pound piece of the hull plating and a signal lantern that was probably carried on the MONITOR's deck the night she sank in 1862 while under tow.

Dr. Charles Phipps of the University of Sydney in Australia has sent us a status report on the PLATYPUS I submersible. He says it is still "in the pipeline" after many annoying delays. Stress analysis calculations are completed and their planned date for having the vessel operational is March 1980.

))) **Silver Ore Found on East Pacific Rise.** During a French American expedition to near the mouth of the Gulf of Baja California last year off Mexico numerous bottom samples were taken from a hot springs area. The warm water emanates from a seafloor spreading zone of the East Pacific Rise in the general area of 21° N. Lat., 109° W. Long. *Sea Technology* has learned that the samples taken from a depth of 3,300 meters using the French submersible *Cyana* yielded numerous sulphide ores. They showed silver contents conservatively estimated at 500 parts per million. Along with 23 to 28.7% zinc, 19.9 to 42.7% iron and 2.2 to 6% copper, the ores would be attractive for commercial exploitation. Dr. Robert Ballard, geologist of the Woods Hole Oceanographic Institution (WHOI), says that the material is typical of that found in the seafloor spreading ridge zones of the world, such as the Mid-Atlantic Ridge. It is the product of deep sea volcanic eruptions. The ridge zones differ from the hot springs of the Red Sea rift zone where the brine concentrations result from leaching, he said. Now Ballard is planning another expedition to the area with permission of the Mexican government, using the Navy owned, WHOI operated, submersible *Alvin*, with cooperation from the National Science Foundation. Ballard again will use the Charge Coupled Device (CCD) camera produced by RCA. CCD replaces the usual vidicon for video cameras and can take still or motion pictures. (Details on CCD in *Sea Technology* for February, page 42.)

New unmanned submarine operation

Stavanger — Sub Sea Surveys Ltd. UK and the two Norwegian companies Myrens Verksted A/S and SIMRAD A/S have formed the company Subtek A/S to work within the field of underwater technology using remotely controlled submersibles. The submersibles are equipped to perform maintenance work, pipeline surveying, leak detection, pre-surveys of pipeline routes/platform locations and surveillance during installation. Each of the three companies own 1/3 of the shares of Subtek.

MONITOR MISSION: "ACCOMPLISHED"

story by: MICHAEL MULCAHY

HARBOR BRANCH FOUNDATION

On August 2, 1977, Harbor Branch completed a project in cooperation with NOAA* by performing a precise photogrammetric survey of the USS Monitor, the Civil War ironclad vessel sunk off the coast of Cape Hatteras, N.C., in 1862. It was called a "complete success" by Roger Cook, director of operations for the mission. It began on schedule July 17 and continued daily thereafter except when weather dictated postponement of activities.

Local and national news media were represented at the scene, including the Palm Beach Post, local North Carolina papers, CBS-TV News, The Washington Post and Newsweek Magazine.

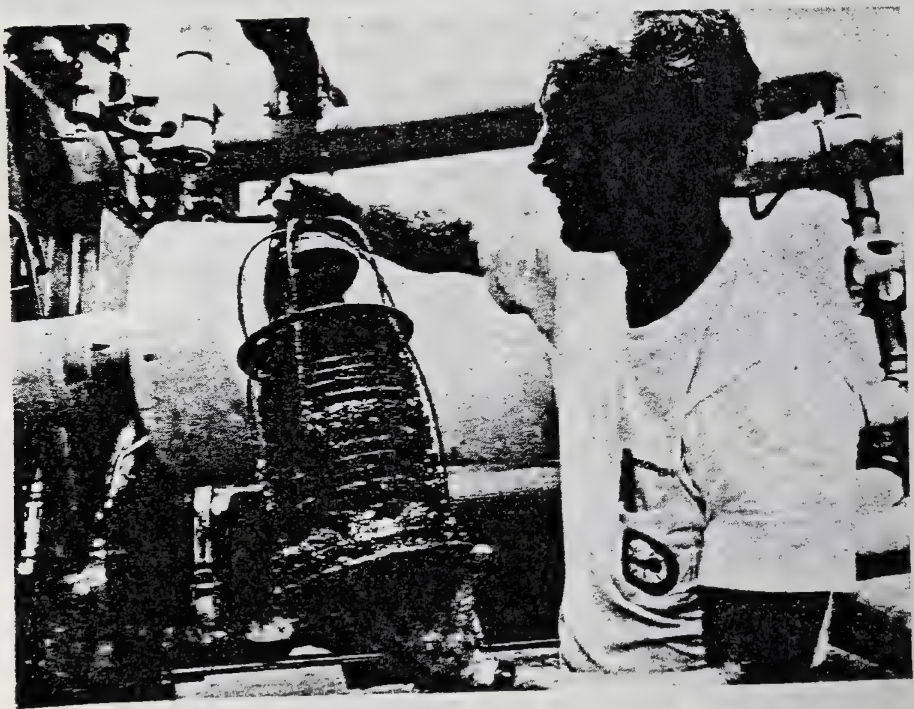
The plan had been for a three week mission, with the knowledge that all phases of the project could be completed in less time if the weather was perfect– which it was not and never is. The first week involved side scan sonar and unmanned reconnaissance of the Monitor and surrounding area to insure its safety for diver lockout and operation of the submersibles SEA GUARDIAN/CORD* systems were used for this first phase. The day that the CORD obtain the now-famous black and white videotape segments of the Monitor and the turrent area, the visibility was nearly 150 feet. This was not to be equalled during the rest of the mission, as visibility at the 220 foot level was to dwindle sometimes to 5 feet or less.

Coordination and logistic support for the mission was remarkable both at sea and ashore. The cooperation of our sub crew and operations personnel prompted Don Rosencrantz of the Naval Ocean Systems Center in Hawaii to remark that in more than ten years of going to sea on various projects of this type this was the most thoroughly professional group with whom he had ever worked. He was impressed particularly by the versatility and interchangability of the various members of our sub crew.

Days were long during the course of the project--wakeups of 5 a.m. were commonplace . . . and not just for the ships' cooks, John Margetis and Steve Cartwright. The anchors would be pulled early in the morning and the ships would set out for the operations area some 10 miles distant from the Diamomd Shoals anchorage. By 0900 the decision would be made, or was close to being made, as to the weather conditions' effect on the day's operations. The weather was a constant factor to be reckoned with as the submersibles can be launched and safely recovered only in seas up to 6 or 7 feet. These seas were not at all unusual, and waves to the heights of 8 feet or more were seen on several occasions.

The second week was devoted to underwater photography. Cameras were mounted on the submersibles and one diver hand held a camera manufactured by Benthos. Late in the week weather was sufficiently clear for the photo baseline to be implanted on the bottom alongside the Monitor. This was done in a day-long operation. The baseline was used as a guide for positioning the sub to accurately "flyover" the wreck. Harbor Branch divers who locked out during the mission were Gene Melton and Richard Roesch. When a diver locks out of the submersible there is always a dive tender in the dive compartment of the sub. Tenders during the mission were

(cont'd)



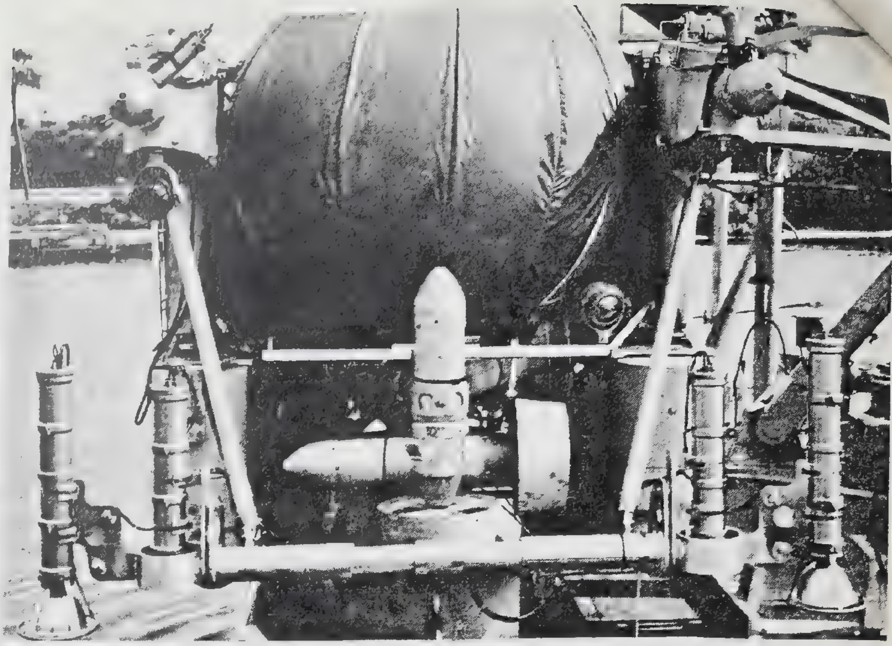
Tim Askew holds the red-lensed lantern retrieved from the Monitor wreckage. It is thought to be the lantern used as a distress signal at the time the Monitor sank.

*NOAA-National Oceanagraphic & Atmospheric Assoication.

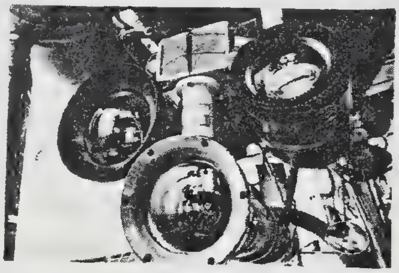
*SEA GUARDIAN/CORD-cabled observation rescue device.

Harold Wilson and Jim Bott. Sub pilots were Jeff Prentice, Marshall Flake and Tim Askew. Officially invited guests aboard the submersibles for some dives included Dr. Harold Edgerton of MIT and Tom Smoyer, Harbor Branch's Photographer who was present on a dive that lasted more than three hours.

By the end of the mission all objectives had been met and the timetable shortened as the mission was wrapped up three days early. The photogrammetric survey using stereo camera pairs had been performed (this will hopefully yield a three dimensional view of the Monitor); Gene Melton had literally walked on the deck of the old Civil War vessel; and three objects had been recovered: the Edgerton camera, lost in the original discovery mission of 1973; a 3 x 4 foot section of deck plate that broke off the wreck in the attempt to recover the Edgerton camera, and finally the unexpected treasure of the red-lensed lantern that is thought to be the same one that was the last sign of the Monitor as she sank on December 31, 1862. The entire group who played a part in the mission are to be congratulated, including those Harbor Branch employees who did not make the trip but gave support to the planning and readiness for this historical mission.



A front view of JOHNSON-SEA-LINK submersible with photogrammetric camera equipment connected. This was used to yield a three dimensional picture of the Monitor wreckage.

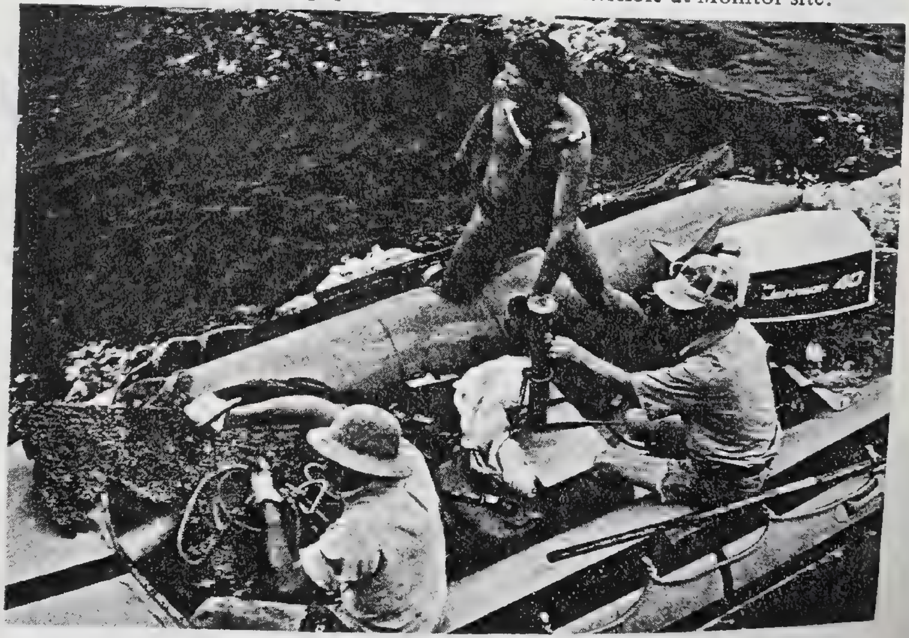


Unmanned tethered vehicle carrying TV photographic & sampling equipment.

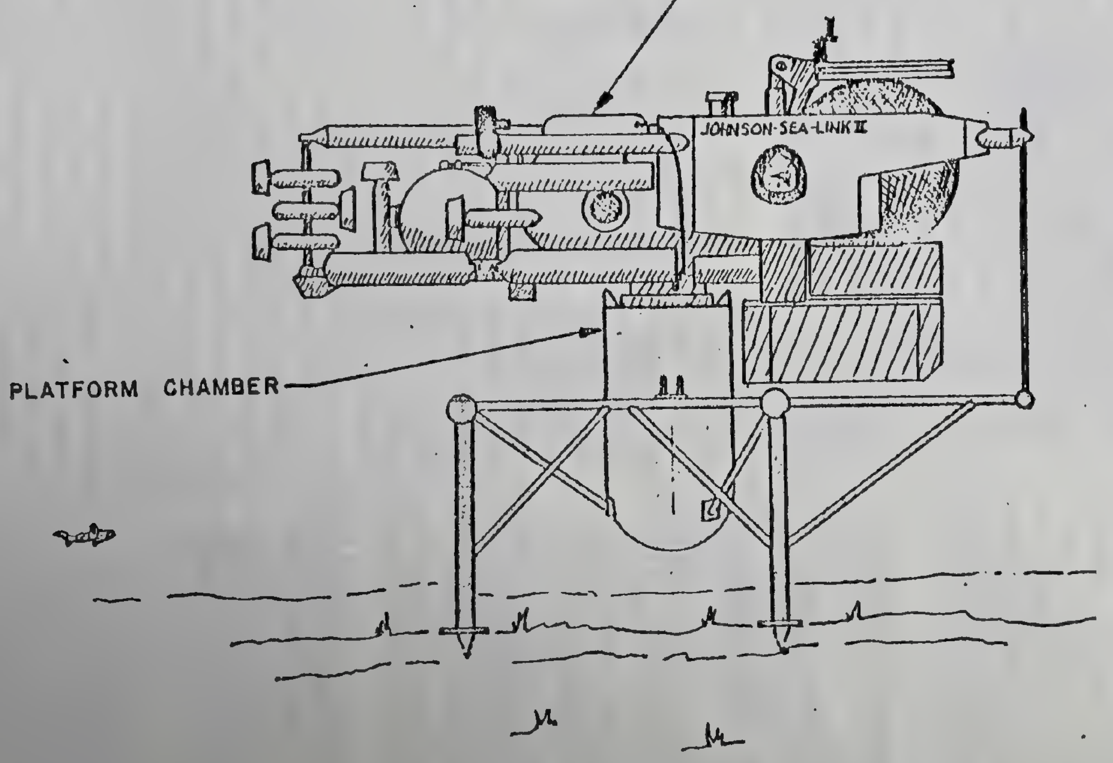
JOHNSON-SEA-LINK I

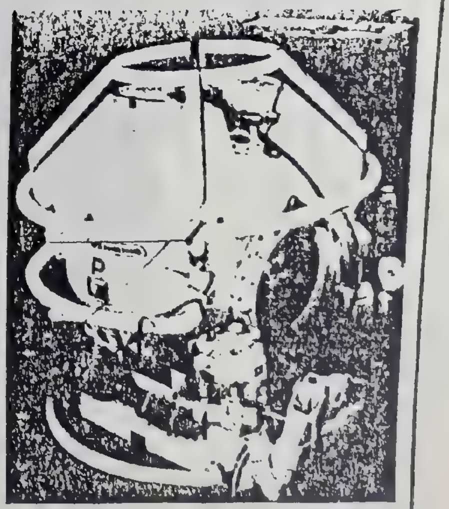
Diver atop J-S-L I during recovery of the submersible at Monitor site.

A section of the deck plate broken off the Monitor in an attempt to recover the camera lost by Dr. Edgerton when the ironclad was first discovered in 1973.



Gene Melton, Harbor Branch diver, with officals from NOAA, transporting deck plate after its recovery.


ATMOSPHERIC CHAMBER FOR
PLATFORM CHAMBER PRESSURE
BLEED OFF
JOHNSON-SEA-LINK II
PLATFORM CHAMBER



Oceaneering International's *Ocean ARMS II* two-man work bell, installed on new dp drillship *Pacnorse 1* in Scotland last month. Both have capability up to 1,000m.

SCHEMATIC OF SUB AND PLATFORM CHAMBER
FOR DRY TRANSFER OF PELLICLE PLATES

SK-317

6/79

All Perry Divisions Now Housed Under One Roof

After two years of planning and construction, all personnel of Perry Oceanographics, Inc., are housed at the same location—a 115,205 square foot (more than 2 acres) facility located between West 8th and 10th Streets in Riviera Beach, Fla.

The company's four divisions—Perry Ocean Products, Submarine Builders, Ocean Engineering and Ocean Services—were originally scattered at various locations in Riviera Beach and nearby Lake Park. Now, with an eye toward maximum efficiency, the plant is functionally divided. Manufacturing occupies a 18 m by 180 m bay. Underwater testing is performed by the company's nearby waterfront facility with direct ocean access. A large central area is reserved for future expansion.

Professor Don Walsh, Director of the Institute for Marine and Coastal Studies, University of California, and Editor of the *Marine Technology Society Journal* has been appointed to the Advisory Committee on the Law of the Sea by Ambassador-at-Large **Elliot L. Richardson.**

PRACTICE FOR INTERNATIONAL RESCUE — Avalon, one of two LMSC-built U.S. Navy rescue submarines, is loaded aboard a U.S. Air Force C5 at Naval Air Station North Island, San Diego. The loading was a practice for a "flyaway" on April 30 when the Avalon was sent to the Royal Navy's Faslane (Scotland) base — the first deployment of the deep submergence rescue vehicle (DSRV) overseas. To make the DSRVs available for international rescues, the U.S. Navy has offered specifications to other countries on the special hatch required for mating.

Life support system, fuel cell tests are A-OK off San Diego

SAN DIEGO — The Lockheed submersible Deep Quest recently demonstrated that a hydrogen-oxygen fuel cell could supply up to seven times as much electrical energy as the batteries that were previously used to power the craft at depth. Simultaneously, the submersible successfully tested a new oxygen-generation and carbon-dioxide removal system that can increase the crew life-support duration sixfold.

In the test sponsored by the U.S. Navy, the fuel cell enabled the Deep Quest to dive to 1,525 meters (5,000 feet), marking history's first dive to such depth with this kind of power source. The dive was accomplished in the Pacific Ocean off San Diego.

Lasting 4½ hours, the test was the climax thus far in a series of 10 successful dives, according to Robert Tyrrell, director of Lockheed Ocean Laboratory. During the dives, the Deep Quest logged a total of 62 hours of submerged opertion.

Another set of dives, including a fuel-cell endurance dive of at least 35 hours, will begin in late spring and will continue for the remainder of 1979, Tyrrell said.

Deep under water, the Deep Quest evaluated the 30-kiloWatt fuel cell power-plant that was designed and sized originally for tests on a Navy rescue vehicle. Two 30-kiloWatt fuel cells on board a Lockheed-designed Deep Submergence Rescue Vehicle could enable the rescue of crewmen from a stricken fleet submarine without stopping to recharge batteries.

Supplied by United Technologies, Inc. of So. Windsor, Conn., the fuel cell on the submarine is similar to those on board the Apollo capsules that helped land U.S. astronauts on the moon. The powerplants consume gaseous hydrogen and oxygen to make electricity electrochemically without combustion. Water is a by-product. The system is completely self-contained and requires no outside power source to start or to operate.

In the other test, sponsored by LMSC, the nation's first all-chemical life-support system demonstrated that it could add to the submerged time for submersibles. It performed flawlessly in Deep Quest for a total of more than 60 hours.

The inventor, Yi-Sheng Li, Lockheed project leader, said the recently installed life-support system is designed so the Deep Quest can stay submerged and operate for 72 hours with a crew of two and two observers. A separate system also was installed for backup emergency life support that will supply oxygen and remove carbon dioxide for an additional 39 hours.

Both systems use potassium superoxide that combines chemically with the moist breath of crewmen to release pure oxygen and at the same time remove the carbon dioxide.

Li said the emergency breathing system can be used in either one of two ways. Selection depends on whether the Deep Quest cabin's atmosphere is contaminated. When there is no cabin contamination, it will supply oxygen to crewmen as an open system for up to 39 hours. If there is cabin contamination, as a closed system the emergency breather will supply 100 per cent oxygen for four crewmen for at least six hours.

The submersible life-support system is derived from the successful, patented Lockheed Mine Rescue Breather, according to Li. It is safer, more reliable, more efficient, and requires less maintenance than the original high-pressure oxygen/lithium hydroxide equipment used on the Deep Quest.

BRITISH-U.S. DEMONSTRATION

Sunken Submarine Rescue Tested

By KIP COOPER
Military Affairs Editor
The San Diego Union

The Navy is coming ever closer to realizing its 50-year dream of being able to rescue distressed submariners from the ocean floor.

It demonstrated earlier this month that with the help of modern technology it can transfer men underwater from a "sunken submarine" to another submerged submarine.

The demonstration took place during a joint U.S.-British naval exercise off the coast of Scotland.

U.S. technology was called into play when the British diesel-electric submarine Odin reported that it "sank" in 400 feet of water.

A distress call was radioed to San Diego, asking that one of two deep submergence rescue vehicles (DSRV) — the Avalon or the Mystic — be airlifted to Scotland to "rescue" the trapped British sailors.

The Avalon and Mystic are fitted with a special skirt that operates somewhat like a sink plunger to seal an escape hatch of a submarine, allowing the crew to leave the sunken craft and be taken aboard the DSRV.

The DSRVs can effect a linkup even if the sunken submarine is lying at as much as a 45-degree angle.

The Air Force immediately sent a giant C-5 Galaxy and a C-141 Starlifter to North Island Naval Air Station, loaded the Avalon on board and took it to Glasgow, Scotland.

From there, the Avalon and its 16-man crew was taken by highway to the British Clyde naval base and loaded piggyback to the after casing of the nuclear-powered British submarine Repulse.

The Repulse sailed to the scene of the Odin, dived and released the Avalon. The DSRV located Odin, even though the visibility in the water was down to a few feet, by using electronic equipment.

Avalon crewmen said the craft made eight round trips between the Odin and the Repulse to effect transfers.

"A number of British technicians wanted to ride the Avalon, so we took people from the Repulse to the Odin and people from the Odin to the Repulse," a crewman said.

The Avalon trip that began at 6 a.m. April 29 ended with the return of the DSRV to San Diego late in the evening of May 14.

The San Diego craft had achieved a historic first, the first time that men had been transferred between two submarines underwater and the first time that men had dived in one submarine and surfaced in another.

British sailors hailed it as the "first-ever underwater 'space shuttle' linkup between two dived submarines."

The DRSV is a 50-foot, battery powered mini-submarine that looks like an oversized torpedo. It weighs about 72,000 pounds, but is highly maneuverable in water.

After attaching itself to a sunken submarine, it pumps the connecting chamber dry of water and then can take 24 men at a time aboard from the sunken sub without any of them getting wet.

British and U.S. Navy submarines and those of most NATO countries are equipped for rescue by the DSRV.

The Avalon and its sister DSRV, the Mystic, were built by Lochkheed Missile and Space Co. in Sunnyvale.

First models of the craft were delivered to the Navy here in July 1972.

After undergoing research and development tests, the DSRVs Avalon and Mystic formally were accepted by the Navy in October 1977.

The Navy's first efforts to develop the capability to rescue men from sunken submarines began in 1928. A spherical diving bell capable of carrying eight men was developed, but it had a working depth of only 850 feet although it had been tested to a depth of 1,250 feet.

The bell had to be worked from a mother ship and depended on an umbilical cord to provide electricity and communications.

The DSRV can operate independently and has a working depth of 5,000 feet, the average depth of the world's oceans.

The Navy lost 52 submarines in World War II, but these were war losses. Four other submarine sinkings drew world attention because rescues in some of them may have been possible.

The submarine Squalus sank May 23, 1939, in 240 feet of water near Portsmouth, N.H. Twenty-six of the 59-man crew died.

The S-26 sank in 300 feet of water Jan. 25, 1942, near the Panama Canal Zone and only three of its 35-man crew escaped death.

The atomic submarine Thresher sank in the North Atlantic on April 10, 1963, with 129 men aboard and the atomic submarine Scorpion sank near the Azores on May 21, 1968, with 99 men aboard.

The two atomic submarines fell below 5,000 feet and disintegrated, but the tragedies demonstrated to the Navy its complete lack of any real rescue capabilities at depths traveled by modern submarines.

Two weeks after the Thresher loss, the Navy gave a special study group the urgent mission of finding a better way to rescue downed submariners.

The DSRVs can rescue such submariners and can respond rapidly to world disasters, even though there are only two of the craft in the world and both are based at North Island.

The craft that left here April 29 by air was in Scotland on May 1 and ready to take part in a rescue mission that ended sucessfully.

Southwest Research Studying Feasibility of Bell Conversion

Southwest Research Institute is studying the feasibility of a readily attachable and detachable system which could be used to convert a conventional diving bell into a tethered underwater vehicle having the advantages of mobility and a very broad range of economical offshore applications.

The system is known as the Integrated Power and Control Module (IPCM). A principal objective of the program is to reduce costs and risks of diving operations while increasing capabilities.

The module system includes a disk-shaped power, control and equipment pod designed to fit to the bottom of a spherical diving bell, along with a buoyancy unit which attaches like a cap to the top of the bell.

A conventional submersible diving chamber, instead of acting in its usual fashion as a direct "elevator" between a surface support ship and a deep sea work site, could be converted by an IPCM into a relatively low cost, tethered, manned work system able to move horizontally within the limits of cable length, two SwRI engineers have said. A bell so equipped, according to them, would be able to perform some tasks which otherwise would require the services of a highly trained crew of divers, or a specialized work submersible. The system could also undertake tasks now assigned to small remotely controlled vehicles (RCV), because the microprocessor-based control system permits either onboard or remote direction for the IPCM.

The IPCM design calls for a generally disk-shaped structure about 1.2 m thick, 2.4 m in diameter, and weighing less than 2720 kg. In water, the unit can have up to 227 kg of positive buoyancy, or 136 kg of negative buoyancy. The module could be attached to bells up to 2 meters in diameter, with only electrical penetrations through the pressure hull required.

A 30-hp electro-hydraulic power supply is included, sufficient for operating all tools. Basic equipment also includes reversible propulsion and rotation motors, lights, anchor winch and clump for station keeping, emergency release system, a pair of grasping arms, and facilities for adding a wide range of optional equipment for inspection, manipulation, or other tasks.

Upon finalizing of design, a SwRI spokesman said, an IPCM could be completed in approximately 9 months.

))) **Shared Use of Glomar Explorer With Other Countries Indicated.** Shared use of the former submarine recovery ship *Glomar Explorer* with other countries after it has been converted for research deep sea drilling has been signaled by the White House. The current plan is to retire the now venerable *Glomar Challenger*, the Deep Sea Drilling Project (DSDP) ship, which was instrumental in proving the theory of tectonic plate drift and seafloor spreading from mid-ocean ridges. Currently the *Glomar Explorer* is under lease to Ocean Minerals, Inc., for use as a test bed for deep sea mining. When President Jimmy Carter visited Mexico early this year he extended Mexican President Jose Lopez Portillo an invitation for his country to participate in the DSDP. Since future operations of the *Glomar Explorer* would be suspect if operated by only the U.S., watch for other countries, including Russia, to be invited. The administration wants to avoid any hint of misuse. The ship will be available for conversion by the National Science Foundation in 1981 or 1982. It could be an NSF budget request item in the Fiscal Year 1981. It would be capable of much greater penetration of the earth's crust than the *Challenger*, even going through it to the mantle, or athenosphere, as was the aim of the ill fated Mohole Project of the early 1960s.

WORLDWIDE MARINE/OFFSHORE POSITIONS

As P.E.'s and Technical Search/Member Employment Consultants to IEEE (all Societies) we receive 1,200-2,500 jobs EVERY month from U.S. and foreign controlled companies from all over the world, not just EE's but all technical disciplines: geophysics, engineering, biomedics, etc. **Many of our exclusive searches are in Marine/Offshore Technology with Fortune 1000, ENR 500 and major foreign gov'ts. and Co.'s. All positions are totally FEE PAID incl. relocation, o'seas allowances, etc.**

Obviously we can't list all positions, so we have chosen short professional ads as our way of inviting fellow **MTS Members** to participate within our totally confidential **Marine/Offshore Personnel Database** should you be either temporarily unemployed or seeking a career change. Very important: **Unlike many executive search and personnel agencies, we NEVER reveal Personal/Employer identities to anyone WITHOUT PRIOR APPROVAL.** Further, to pinpoint YOUR objectives, please call **before** mailing a resume w/current earnings stated for database coding. **Minorities and Women encouraged to respond. Paul Ward (201) 891-5324. See you at OTC '79.**

ANDREW ASSOCIATES • Franklin Lakes, NJ 07417
Amman • Brussels • Caracas • Hong Kong •
Jeddah • NYC • Tehran • Tokyo

Andre Galerne has announced that IUC's support vessel Aloha has completed sea trials in the Bahamas and is now in Houma, La., for refitting. The Aloha is available for inspection and survey services in the Gulf of Mexico.

Standard underwater inspection / survey support equipment includes IUC's 1,000-foot submersible Mermaid II, complete with a specially designed launch / recovery system that permits operation in heavy weather conditions. New onboard the Aloha is IUC's 1,200-foot remote controlled Tethered Underwater Survey System (TUSS) equipped with CCTV on a pan and tilt unit, plus a three-function manipulator. A Honeywell RS-7 acoustic position indicating system has been installed, allowing precise positioning and tracking of either the Mermaid or TUSS or both, simultaneously, relative to the Aloha.

The Aloha is a 143-foot offshore supply vessel outfitted for submersible, deep diving, remote controlled Tethered Underwater Survey System (TUSS) and survey support missions. The vessel can support a complement of 24 persons for operating periods of up to 30 days at sea without replenishment.

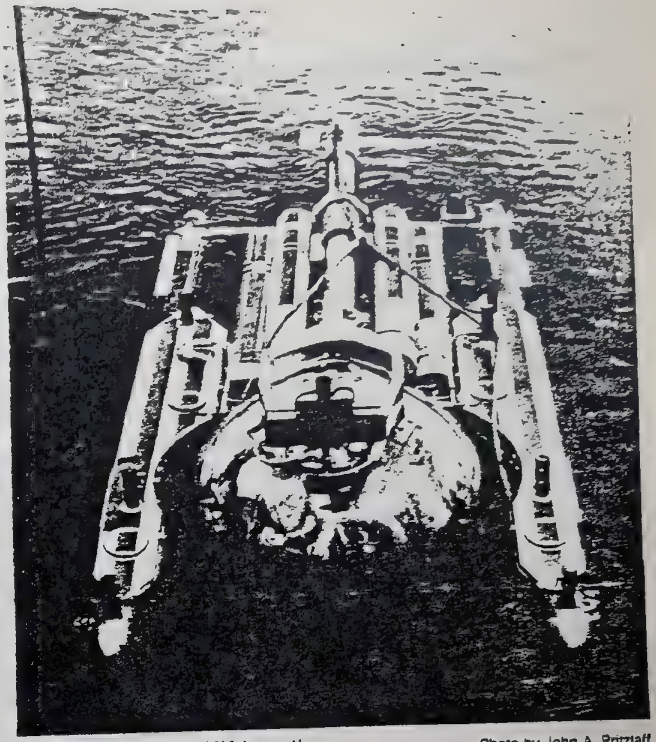
Additionally, the Aloha carries diving equipment with special gas mixing equipment installed as necessary.

For further information, contact **Andre Galerne,** President, International Underwater Contractors, Inc., One Allen Center, Suite 1000, Houston, Texas 77002.

Bell Panoramic Window Patent Awarded To IUC

International Underwater Contractors (IUC), City Island, N.Y., has been awarded a patent for a radically new panoramic window for diving bells that opens a whole new range of possible activities for many existing bells. Conventional bells may be retrofitted with the IUC window at a reasonable cost; the windows will permit the bells to be fitted with manipulators, cameras, TV equipment or other external working devices for increased bell capabilities.

To insure adequate sealing, IUC engineers developed a unique system of angled mating surfaces between the window and its mating flange, backed up with an O-ring and bolted-on retainer, offering absolutely positive sealing. In addition, as the bell is lowered, another self-centering hydraulic seal is provided at depth.



JOHNSON-SEA-LINK in action

Photo by John A. Pritzlaff

Harbor Branch Foundation, located in Fort Pierce, Florida, in one of the world's leading manned undersea research centers. As a not-for-profit corporation, it was established primarily for research in the marine sciences and for development of oceanographic tools and systems for undersea research. The Foundation, composed of a complex of engineering and scientific research laboratories stretching along a small channel which lies perpendicular to the Indian River section of the Intracoastal Waterway, was founded by its President, **J.S. Johnson,** medical and surgical supplies industrialist. Vice President is **Edwin A. Link,** founding member and past officer of MTS. The channel and surrounding land on which Harbor Branch is located is named Link Port in his honor. The well-known manned submersibles JOHNSON-SEA-LINK I & II were designed by Ed Link and developed by the staff of the Engineering Laboratory. It was with the support of SEA-LINK II that a joint physics project with NOAA was successfully completed last year, placing, for the first time, cosmic ray detectors on the ocean floor at a depth of 1000 feet for the study of sub-nuclear particles in the process of cosmic radiation.

P&O Subsea has still not sold its fleet of four submarines and two surface support vessels. The company says discussions are still being held with potential purchasers. P&O has not operated its vessels since last summer. They include a *Perry*, a *Leo* and two *Mermaids*. Vickers Oceanics may have as many as four enspection submarines for sale as part of its withdrawal from the market.

International Salvage Meeting Planned

The Marine Technology Society and the Maritime Association of the Port of New York will sponsor the first "International Symposium on Marine Salvage," to be held October 1-3, 1979, at the New York Hilton in New York City. This symposium has been termed by salvors, leaders and organizations in the industry as an event of major international maritime significance.

The meeting will be composed of five general sessions subdivided into 13 meetings, and four principal luncheon/dinner addresses which will be delivered by distinguished men from the international community of maritime nations involved in marine salvage. The symposium will focus on three primary areas—salvage operations, legal and financial aspects, and the role of governments and international organizations—and should be of interest to shipowners, insurance underwriters and salvors.

For more detailed program information, please contact the International Symposium on Marine Salvage, 34th floor, 80 Broad Street, New York, New York 10004; (212) 425-5704.

MARINE TECHNOLOGY 79

The Annual Conference and Exposition of the Marine Technology Society will have a new title this year—**Marine Technology 79.** The "Oceans" title, used in past years will be retained by IEEE for a regional conference on the West Coast. The MTS as a society will not participate in this conference, although our local San Diego Section will.

The MTS Conference will be held in New Orleans from October 10 through 12, 1979, at the Hyatt Regency Hotel. The theme will be "Ocean Energy." General Chairman for Marine Technology 79 is Capt. John R. McDonnell of the U.S. Naval Oceanography Command.

OCEANS 79. The meeting is to be held September 17-19 at the Town and Country Convention Center in San Diego. **Dr. Howard Blood,** Technical Director of the Naval Ocean Systems Center, is General Chairman and **Dr. William Nierenberg,** Director of Scripps Institution of Oceanography is chairing the technical program. The meeting will include technical sessions on a broad range of marine topics and an exhibit of marine products and related services.

During 1979, Frank Busby is serving as acting Chairman of the Undersea Vehicles Committee, while Joe Vadus is serving as MTS Vice President for Technical Activities. Frank Busby can be contacted at:

R. F. Busby Associates
576 S. 23rd Street
Arlington, VA 22202 Telephone No. (703) 892-2888

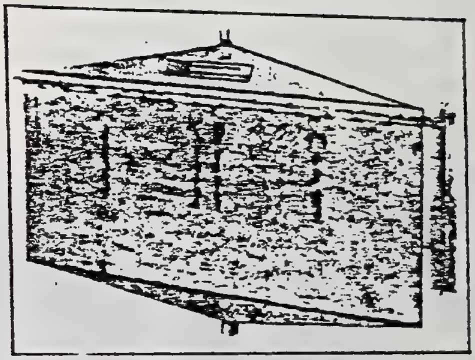
SUBMERSIBLE SAFETY STANDARDS

The working group on Submersible Safety Standards, chaired by John Pritzlaff, is meeting at OTC Houston on Sunday April 29. This group will review the final draft report that culminates a two year effort in developing safety guidelines. The resulting third book in the submersible safety series will be underwritten, in part, by the Link Foundation, Traveler' Insurance, Det Norske Veritas, and the Japanese Marine Science and Technology Center. This book will be published this summer.

Safety

Kinergetics of Tarzana, California, has developed a seawater powered heat source for lifeboat chambers, lockout submersibles and bells. The heat cell is activated by introducing seawater into the cell reaction chamber. Heat is generated as long as seawater is in contact with the cells, allowing reliable initiation and maintenance of the heat output.

The heat cell has 14 times more heat output than lead acid batteries. Standard heat outputs are 20 000 Btu for 24hr and 32 000 Btu for 24 hr. Heat output and duration can be tailored to most requirements. The temperature is controlled by the diver inside the chamber.



With the use of the seawater heat cell, a realistic and reliable system can be made to provide heat when a bell has been severed from its umbilical or heat for a lifeboat chamber should divers have to be evacuated from their habitat.

Tests were completed on the heat cell last year at Barrow-in-Furness, England, by Kinergetics and Aqua Logistics and witnessed by Lloyd's, NPD, Northern Offshore and BNOC.

Pisces

The Institute of Ocean Science's submersible *Pisces IV* is expected to begin field trials next week after $180,000 in improvements to enable it to safely dive to nearly 2,000 metres and return to the surface.

International Hydrodynamics of North Vancouver began the internal changes to increase the 12-ton craft's safety margin in January, and work is just about completed, according to Dr. Bob Smith of the institute.

Smith said initial trials will be conducted in Indian Arm, followed by manned dives of 600 metres in Jervis Inlet before an unmanned dive of 2,000 metres late this month or early next in the deep ocean off the continental shelf.

"She's been changed so much she could actually be called *Pisces VI* by now," Smith said, adding that with the latest changes the vessel could be brought to the surface by its crew even if all the trim spheres remained flooded.

Although built to withstand pressures at the 2,000-metre mark, the craft has been limited to about one-third that depth because of fears it would develop negative buoyancy and be unable to respond to commands to resurface.

Natural Hydrocarbon Seepage Investigated at Texas A&M

Natural marine hydrocarbon seeps "occurring in small amounts locally can spread over wide areas of the Gulf and Caribbean. These comprise the predominant source of tar floating on the Gulf, on its beaches, and within and on the sediments of the bottom of the Gulf."

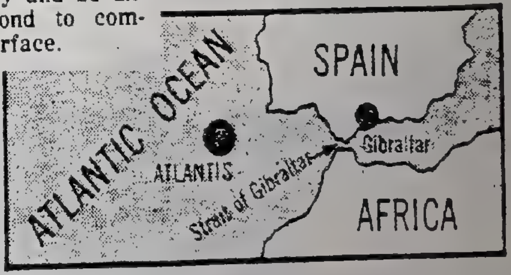
These are among the conclusions of a Texas A&M University program described in "Naturally Occurring Hydrocarbon Seeps in the Gulf of Mexico and the Caribbean Sea." The recently released report summarizes a wide variety of research related to natural marine seeps.

Mentioning historical documentation dating back to the 16th century, the report also notes the difficulty of tracing marine seeps and of identifying origin for specific oils.

As part of the research, funded by oil companies and Sea Grant, the submersible *Diaphus* videotaped fish swimming apparently obliviously through gas bubbles escaping from the seafloor. Researchers also collected seismic profiles clearly showing oil seepage.

Copies of the report are available from Dr. Richard Geyer, Department of Oceanography, Texas A&M University, College Station, TX 77843.

Scientists Find Signs Of Lost Continent



MOSCOW (UPI) — A Soviet scientist says a recent expedition west of Gibraltar may have found the lost continent of Atlantis — right where Greek philosopher Plato predicted it would turn up.

Prof. A.A. Aksyenov, director of the Soviet Oceanology Institute, said in the magazine Light that a recent expedition found ruins and a group of flat-top mountains about 300 to 600 feet below the surface of the ocean.

The horseshoe-shaped area is in the Atlantic off Gibraltar, the area Plato designated in his account of tales about the lost continent, the first report to mention an advanced civilization lost underwater.

Aksyenov did not give any more details on the location of the ruins or the horseshoe-shaped area.

"The geologists think it quite possible that this horseshoe was a rather large archipelago that submerged as the result of geological unrest," he said.

He said eight underwater photographs taken by the research vessel Kurchatov focused on the flat top of one of the underwater mountains, Mt. Amper.

"The pictures show quite vivdly lines of brick or stone walls and fragments of wide steps," the oceanologist said.

He said the area "naturally demands more careful investigation" but that the top of Mt. Amper could easily be examined more closely with existing equipment.

The scientist currently is on a second expedition to the site and was expected to return to the Soviet Union in mid-April.

Manned Submersibles Study Cosmic Radiation Deep In The Sea

by
Robert S. Jones
Harbor Branch Foundation, Inc.
and
Dr. Peter Kotzer
Western Washington University

Harbor Branch Foundation, Inc., in a joint physics project with the National Oceanic and Atmospheric Administration (NOAA), has placed, for the first time, cosmic ray detectors on the ocean floor at a depth of 1000 feet. This experiment is but one step in a vast program to study background-free cosmic radiation to the greatest depths possible in the oceans.

Key to the success of the current missions is the versatile Harbor Branch submersible *Johnson-Sea-Link II*, which is being used to assist physicists in their undersea cosmic ray research.

This innovative experiment in elementary particle and nuclear physics is designed to study behavior of subnuclear particles that make up the enormous quantity of cosmic radiation constantly bombarding the earth, such as muons and neutrinos.

At the earth's surface, the radiation is so intense that thousands of muons pass, in a steady rain, through our bodies each second. However, at the greatest depths of the ocean a trillionfold fewer are believed to exist.

When sensitive detectors are prepared at the surface they record a considerable background level of cosmic radiation. This makes it virtually impossible for scientists to separate the multitude of particle tracks captured on their photographic plates at or above sea level from those found and produced at great ocean depths.

A primary objective of this research project is to actually prepare photographic plates at the experimental depth and place them on the sea floor. The layer of sea water overhead would then act as a homogeneous filter to exclude a large number of extraneous particles and allow the physicists to determine the characteristics of remaining particles and of those that are locally produced as they pass through the detectors. It is these particles that comprise the most interesting constituents of the cosmic flux.

The project originated in a meeting held at Harbor Branch Foundation in February, 1977 among officials of four participating organizations. Co-conveners of the meeting were Dr. Robert S. Jones, Director of the Harbor Branch Foundation's Johnson Science Laboratory and Dr. Kurt Stehling, Senior Science Advisor of the NOAA Office of Ocean Engineering.

The participating physicists were Dr. Peter Kotzer of Western ton University, and D Lord and Seth Nedderme of the University of Washington. Proposals were completed and the mission was approved in a follow-up meeting in March.

After several months of intensive and coordinated activity among the research and engineering groups, the first cosmic ray detector was deployed on October 4, 1977. Photographic emulsions, the key detector elements, were prepared in the *Johnson-Sea-Link II* on the ocean floor, at a depth of 1015 feet off Grand Bahama Island.

Dr. Kotzer, assisted by Harbor Branch diver Richard Roesch, performed the delicate operation of preparing the sensitive emulsions. Dr. Stehling served as scientist-observer in the forward compartment and assisted by providing instructions, from a checklist, over the submersi-

Reprinted from Sea Technology, March, 1978

intercom system to the r/scientist team in the arkened dive compartment in the stern of the submersible.

Once the detector was prepared and placed in a pressure-resistant glass sphere, it was locked-out of the submersible by way of an innovative technique developed by Harbor Branch Operations Director Roger W. Cook. Cook, with assistance from the Harbor Branch Foundation's engineers and technicians, designed and constructed a unique docking platform which functions similarly to that used in docking with orbiting space stations and is capable of withstanding the considerable pressures at the required working depth (over 30 atmospheres). This platform had been lowered previously to the ocean floor by the Research/Yacht *Sea Diver.*

Submersible pilot Tim Askew landed the *Johnson-Sea-Link* on the platform and mating was completed when sea water trapped in the platform chamber was vented to one-atmosphere holding tanks on the submersible. The result was a water- and pressure-tight seal between the mating flange and O-ring on the *Johnson-Sea-Link* and the mating surface on the docking platform's chamber. The small pressure differential remaining was equalized to about one atmosphere, making it possible for diver Roesch and scientist Kotzer to open the hatch and transfer the cosmic detector to the docking platform's pressure chamber. This operation itself was a record-setting endeavor in that it was the first dry transfer of a scientific package at depth over 1000 feet.

Closing of the hatch and the breaking of the mating seal signaled completion of the eleven-hour mission. The *Johnson-Sea-Link* returned to her berth aboard the tender, *R/Y Sea Diver*, leaving the docking platform and the first cosmic detector on the ocean floor. The mission had been a total success.

The mission was repeated on October 6, with pilot Jeff Prentice performing the docking maneuver. A second detector was locked out by the scientist/diver team.

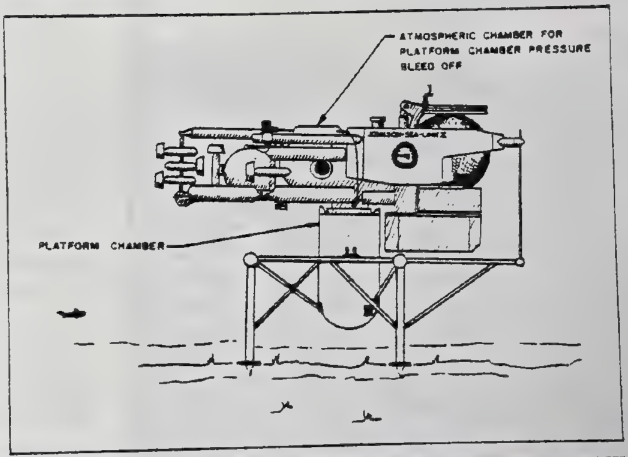
On October 7 the mission was completed when Roger Cook, as pilot, and Dr. Jones, as scientist-observer, returned to the docking platform where they used the *Johnson-Sea-Link*'s manipulator arm to place a protective cover over the platform chamber's mating surface. One of the detectors remained in the chamber and the other was transported up the sloping sea bottom and placed at 400 feet.

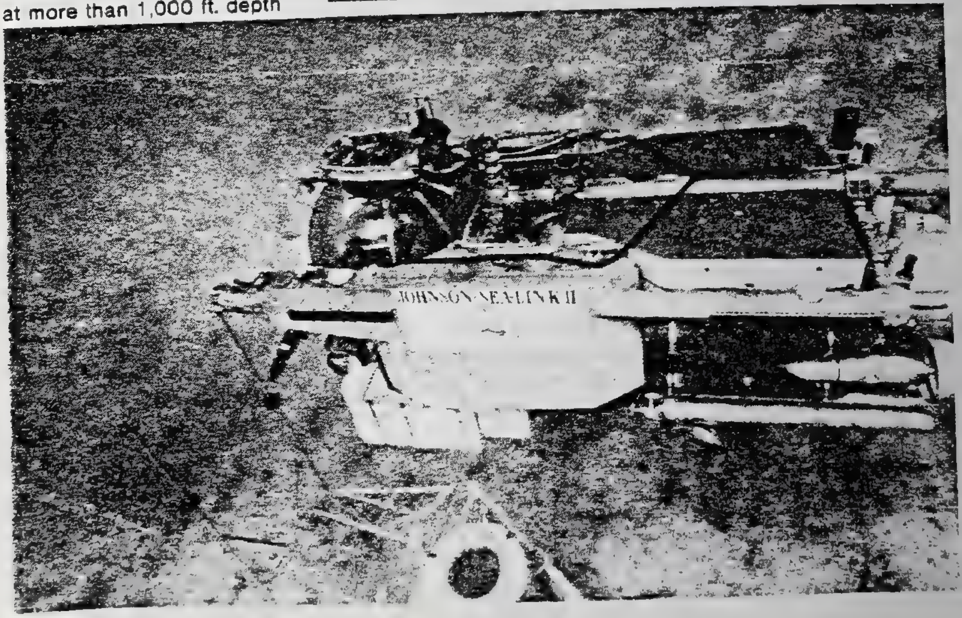
In a reversal of the deployment procedure, one of the detectors will be recovered and developed on the sea bottom this month and the other, along with the docking platform, will be recovered in October, 1978. Scientists will use computer scans of the photographic plates to recognize and analyze the tracks of muons and other interesting particles recorded in the plates.

The current undersea cosmic ray experiments sponsored by Harbor Branch, NOAA and the participating universities are expected to provide important information on radiation caused by muons and other particles to depths about 10 times greater than previously achieved. From such data, it is possible to determine the composition, energy spectra and — perhaps by inference — the cosmic origin of the particles. If successful, undersea cosmic ray physics will be greatly advanced and significant steps will have been taken toward establishment of new and basic techniques required to meet man's quest for a new window on the universe — neutrino astrophysics.

Harbor Branch Foundation, Inc. is a not-for-profit corporation established primarily for research in the marine sciences and for development of oceanographic tools and systems for undersea research. It is one of the world's leading manned undersea research centers and participates in and sponsors many diverse projects. (ST, Dec., 1975, page 22 for a profile of the Foundation.) ▷

Opposite page, Harbor Branch diver Richard Roesch, pilots Tim Askew and Jeff Prentice and Drs. Kotzer and Stehling examine "hard hat" of the type used to protect pressure resistant glass spheres housing the cosmic detectors. **Right**, schematic showing submersible and platform chamber mated for the dry transfer of pellicle plates. **Below**, *Johnson-Sea-Link II* submersible "flying" over the docking platform. The platform was custom-fabricated by Harbor Branch personnel. The actual transfer was the first dry transfer of a scientific package at more than 1,000 ft. depth





Soapbox

Restore The Ocea “Exploratory Spirit

Senator Lowell Weicker, Jr., Republican, Connecticut, is serving his second term. As one of the small band of Senators and Representatives supporting ocean programs, he has been outspoken in his advocacy of ocean science and technology. In March Weicker, a comparative liberal, declared himself in the race for the Republican nomination for president at the 1980 convention.

The age of pioneering conservatism was born after the last footprint was pressed into the lunar surface.

The NASA pipeline of money for space exploration, shut down to a trickle in the early 70's.,was not the only reason for the decline in manned space activities.

A national loss of "exploratory spirit" was more to blame. Throughout its history the United States has never been in such a state of pioneering lethargy as now prevails. The signs are everywhere. New initiatives come slowly and are few. The nation faces an energy crunch that could be more economically devastating than anything we ever faced, yet few viable imaginative plans for using new sources of energy are seriously sought.

The oceans have not escaped either.

The bright future that the oceans hold for us in terms of energy, food, minerals and recreation can be completely realized only when the light of man's mind and imagination is allowed to penetrate its darkness. This means that scientists and explorers must spend many hours, days, years beneath the sea to bring us firsthand information necessary to utilize and protect the sea to the fullest extent, but little of this is now being done.

On March 14, I queried NOAA officials about the progress of *Oceanlab* at the Senate Hearings on NOAA's FY'80 budget request. *Oceanlab* is presently only a concept to advance man's capability to directly study and explore the oceans. It was conceived some five years ago to meet the U.S. government's apparent willingness to support scientists working under the sea. At that time (1975) NOAA had no facilities of its own and contracted a German habitat (*Helgoland*) to operate off the coast of Massachusetts.

Since then, through the efforts of Congressman Bill Alexander and myself over $5 million has been appropriated to start the *Oceanlab*. Progress, however, has been virtually non-existent. The only viable program to come out of this exercise, so far, is the old *Hydro-Lab* which previously had been operated for 5 years in the Bahamaa without *Oceanlab* funds. *Hydro-Lab* was purchased by NOAA and is now in the Virgin Islands. It is the center for a small undersea program of scientific research on tropical eco-systems.

What is the problem?

Early in its design phase *Oceanlab* was envisioned as a large autonomous all-weather system. As time passed it became envisioned as a larger and larger system and therfore, more expensive. Even though I reiterated from the start that I would support any viable system that would meet the needs of the nation whether it be a series of small habitats and submersibles with one unit as a focus or a single all purpose system, the die was cast and the autonomous concept rolled on and finally into oblivion.

At the hearing NOAA officials told me that the program has since been halted to be studied further to determine the final design concept and direction of *Oceanlab*.

My dismay at the hearing was not only based on the announcement of further delays after five years of waiting, but also on the clear message that NOAA's spirit of new and innovative ocean exploration is also gone, or at the least, it lies dormant.

Oceanlab, therefore, is a victim of these hesitant times, but since it still has life it should not be abandoned. It has become a symbol of this country's willingness to recapture what it has always been—young, innovative and forward looking.

A common litany among our ranks is that undersea exploration and uses of undersea platforms have not yet proven worthy of government backing and funding. As this argument is presented it is basically a catch-22 of the oceans. For instance, only a handful of scientists have experience in the use of undersea techniques and are therefore, able to judge their application to marine science. However, without the systems to support more work, undersea science will never have the constituency to properly prove itself; and so it goes.

Oceanlab, in whatever form, will help to overcome this problem.

Another argument against Oceanlab is that the commercial diving industry will be hurt by its operation. I disagree wholeheartedly; *Oceanlab* will be used for basic scientific study and exploration. The kind of work that industry cannot afford to do. On the other hand, industry can and should be involved through its technical expertise. In any event, *Oceanlab* should not be in any way competitive with the commercial diving industry.

It should prove to be an exciting tool for science, helping to establish a cadre of ocean scientists with the experience to study the oceans first-hand which I believe is essential to augment traditional techniques of oceanography. And, as important, it will serve as a focus to involve the man-in-the-street, so that he, too, can share in the excitement of discovering the unknown, the beautiful and the potentially useful.

The ball is in NOAA's hands to make the most of the remains of *Oceanlab*. As our lead civilian ocean's agency it has capabilities, resources and know-how to exploit all the possibilities for gaining knowledge about the sea.

NOAA will be faced with many new responsibilities to study and manage our marine resources and I believe that undersea research should be an integral part of its future efforts. ☐

The need for rescue systems for divers working at great depths has been obvious for a long time. Here, two systems are reported. Dave Evans described the Swedish Navy's solution and Capper Neill reports on its latest development

THE development in Sweden of what is probably the world's largest and most sophisticated underwater rescue vehicle could well mark the beginning of a new era in the use of commercial submersibles offshore.

Though designed by the Royal Swedish Navy, the new URF — as it's known — doubtless underlines widespread fears that the increasing use of submersibles in offshore oil maintenance and production will lead to more incidents of underwater craft needing to be rescued.

Indeed, the introduction of the 52 tonne submersible, currently undergoing trials after being refitted at Kockums Shipyard in Malmo, comes at a time when international operators have been calling for a pooling of resources.

But what makes the Swedish Navy's new vehicle different from the rest is its ability not only to rescue just a handful of stranded divers, but an entire crew of 25 if necessary.

Finishing touches

Though the finishing touches are still being added, the basic idea is that in the event of a distress call, the submersible will be whisked either by road or rail to the most conveniently located harbour. Simultaneously a towing boat will set course for the same harbour and, once an umbilical cord is hooked up between the two, the craft will set sail to the emergency zone.

In the meantime, back on board the URF, the diving crew of two are making preparations to descend.— perhaps by spending the tow-out period by undergoing pressurisation in a special chamber — while the craft's operators are updating themselves on the latest situation.

On arrival at the scene, the submersible disconnects from the towing craft and makes its way beneath the waves, homing in on the trapped vehicle by using sonar or monitoring its pinger.

But it is perhaps in the actual docking procedure that the URF will make itself invaluable, especially in the turbulent currents of the North Sea where debris from a production platform aggravates the risk of entanglement and endangers both craft.

Escape hatch

Using one of its manipulators, the URF attaches a wire to the escape hatch of the stricken submersible and then winches itself downwards, placing its rescue skirt over the hatch — mother hen fashion.

It is then a relatively simple matter for the trapped crew to clamber up into the URF, before it floats back to the surface and is returned to shore.

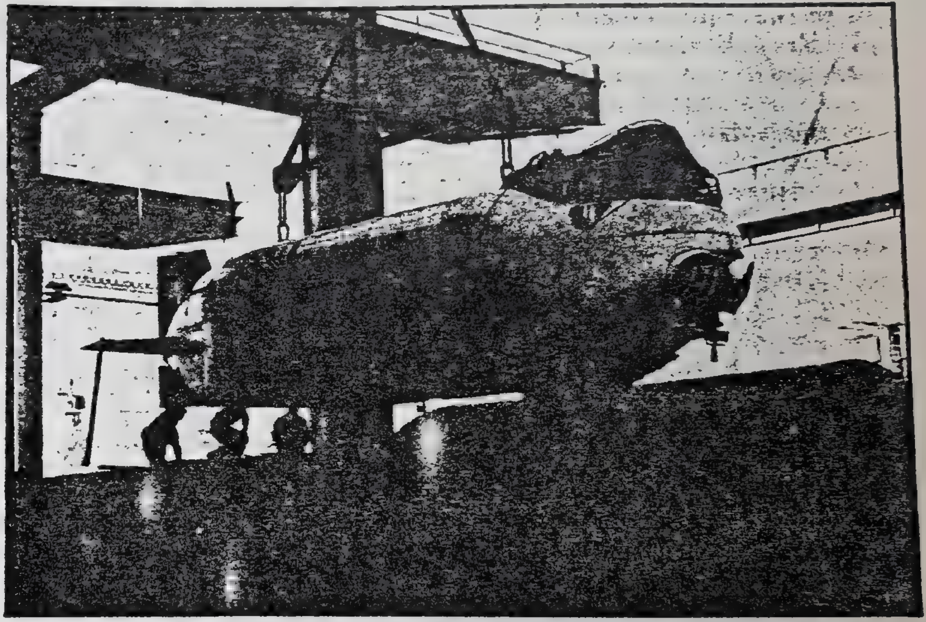
In what may well be a life-or-death situation, it is also the speed of the operation which counts. Commander Johan Onnermark, who is in charge of the URF, estimates the maximum mission time — from when it leaves the shore to the time it is towed back — at about 40 hours. This allows for ten hours of towing each way, ten more for the actual rescue, and a further ten hours as a safety margin.

With sectioned-off compartments, too, problems that might be encountered in other craft — such as decompressing divers — cause little trouble: the passengers and other crew can disembark, while the divers are transported in a personal transfer capsule to another decompression chamber ashore.

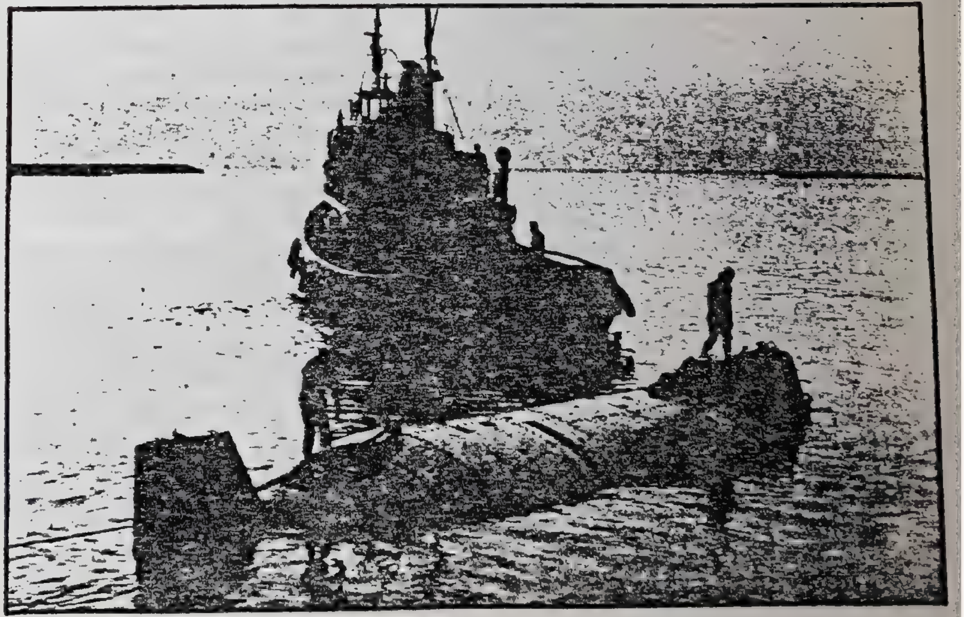
As Commander Onnermark puts it: 'In designing this submersible we may not have mastered all the problems encountered in underwater rescue — but we've made more headway than most.

URF SPECIFICATION

Weight: 52 tonnes
Length: 13.5m
Max diving depth: 460m
Max depth for divers' lockout: 300m
Max speed ahead (submerged) approx 3 knots
Max towing speed (surfaced and submerged) 10 knots
Endurance (at 2 knots and economising on auxiliary power) 10 hours

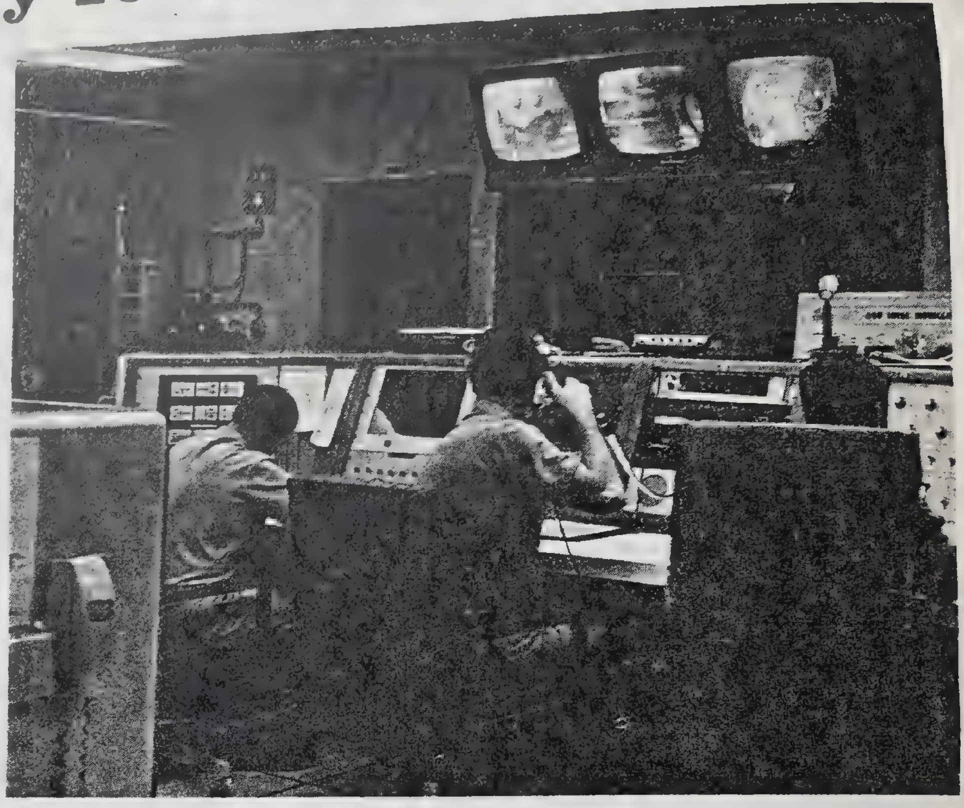


The URF in dock before being launched for its trials is shown above and below



Applying Surface Communications Technology To The Depths

by Michael Mulcahy
Managing Editor



Though man has been at home in and under water for millenia, human performance underwater would be an entirely personal experience save for underwater communications.

In one sense principles of underwater communications vary little from those of terrestrial or atmospheric communications. The three elements of any communication system are transmitter, receiver and transmitting medium. There are hundreds of variations of these components, with accompanying capabilities, limitations and associated costs.

Two basic means of diver communications are available. The first is through a hard wire system in which the umbilical connecting the diver to his life support system also carries communications wires. The second, wireless type, transmits sound acoustically through the water, and is used by both divers and submersibles to communicate with the tender vessel or mother ship.

Sea Technology will confine itself here to a discussion of three basic underwater communications modes, the last of which is still in the embryonic stage of development. They are the UQC-type communicators, diver phones and fiber optics systems.

UQC Communications Systems

In the field of underwater telephones, called "UQC" by a generation of users, there are a number of units on the market, for use at different depths. They range in price from less than $10,000 for a unit good to a depth of 400 meters to one for $50,000 or more that is virtually free from depth limitation.

One development has been made as a result of practical considerations. Since the working frequency of UQC transmissions for years had been 8.0875 kHz and this frequency is easily interfered with by shaft or propeller noise from passing vessels, a new frequency has been developed to handle the load at 27 kHz. This frequency is now used widely for routine communications free from interference, and the former 8.0875 kHz is reserved for emergency use — a natural decision, since it enables communication with Navy ships of many countries.

Navy Diver Communications

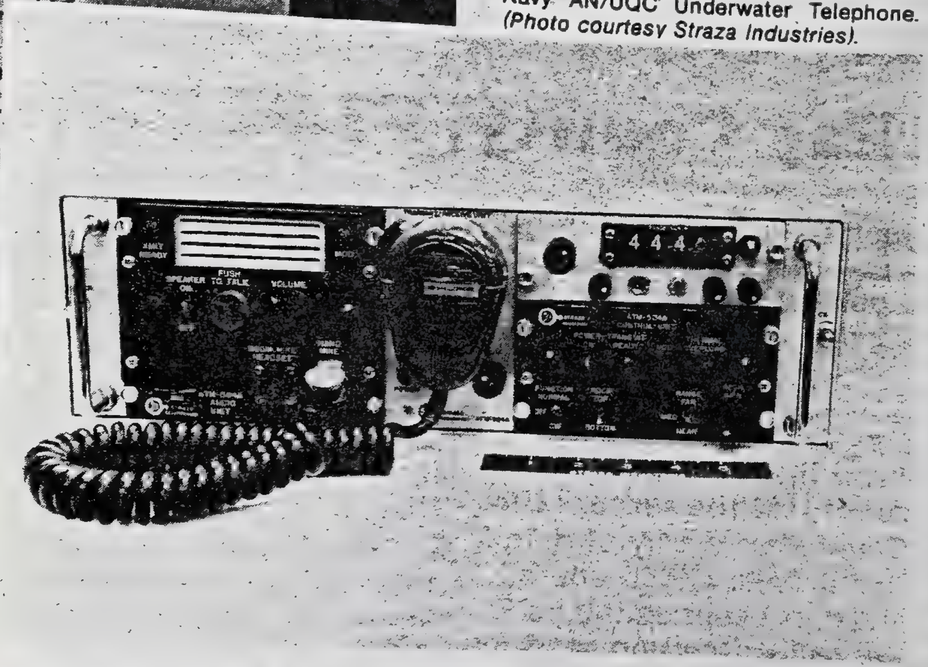
The Navy has some 3000 divers, about equally divided between tethered and untethered modes. In large part the Navy favors hard wire communications systems, permitting diver-to-diver communication only when hooked up in tandem through the surface station.

Helle units are among the most popular. They use speech unscrambling circuitry with mixed gas diving configurations and air radios when diving on air. The reason for the hard wire is that about half of Navy diving is for salvage or other heavy underwater work and is tethered. A vital part of the tether is the communications wire, used principally for diver safety.

For quick-and-dirty reconaissance, the SCUBA outfit is often used. This has no hard wire, and if communication is needed it will often be by means of a through-the-water (acoustic) system. These systems always must contend with problems associated with stratification at depth and high ambient noise levels. The only such system authorized for use by the Navy at the moment is made by Subcom. The Navy is developing its own system that hopefully would have ranges of at least 450 m, but long range Navy hopes approach 1800 m.

The acoustic system is based on the demand principle in the sense of being "switched" on by the diver's voice actuating the circuit. Just as in the case of a submerged submersible, the operating frequency is 8-12 kHz. The development of such acoustic systems is a priority goal to the Navy, since so much SCUBA work is done by special teams (SEAL, Explosive Ordinance Disposal, etc., as well as ship husbandry).

The Navy diving support vessels *Or-*



Left, The control room at the Navy Experimental Diving Unit, Panama City, Fla., provides dive supervisors real-time information concerning numerous dive parameters, TV coverage and voice communications with diver subjects on the bottom. *(Photo courtesy U.S. Navy).* **Below,** One of a number of acoustic underwater telephones available, the Straza Industries ATM-504A is a single sideband transceiver providing voice and CW communications compatible with the U.S. Navy AN/UQC Underwater Telephone. *(Photo courtesy Straza Industries).*

tolan, Pigeon and *Elk River* have installed a unique Naval Coastal Systems Center-developed communications system tailored to saturation diving use. Through it the divers are linked for communications purposes to the Personnel Transfer Chamber and the Main Control Station.

In one development this year, Helle has developed an improved diver microphone, containing a ceramic crystal pre-amplifier. There are no moving parts, and the unit is undergoing tests at the moment. It can be used going through the surface speech unscrambler if diving on mixed gas or air radio if on air. Other manufacturers of commercial diver phones and speech unscramblers include Marconi, Subcom and Divex. Hydro Products' Total Diver Communication System is undergoing testing at the Navy Experimental Diving Unit, Panama City, Fla.

Commercial Communications

Santa Fe Engineering, Houma, La., uses no scuba and dives in either saturation or air modes. The saturation system can double for use in air diving. It contains five functions: Helle speech unscrambler; intercom; tape system (which can receive inputs from divers, dive controllers or the P.A. system); two channel entertainment system; and wireless communications system (used for backup in case of casualty to the speech unscrambler).

When using this system the dive controller can talk with divers in the water or in the bell; divers in the deck decompression chamber; or to deck force support personnel. When diving on air, a Helle air radio is used to improve intelligibility of diver voices.

In another area of underwater communications, some exciting things have been happening in the last year, though not all are near fruition yet. A New England company is working with real-time TV transmission through the water — black and white for the moment. But it would be only a matter of time after the black and white version were introduced until the technology caught up to the demand for real-time color.

The company that develops the first system for real-time, through-the-water, high-resolution color TV transmission will be able to write its own ticket. The technology is still at least two years away from that point, and there are those in the field who say the day is even farther downstream.

One company involved in underwater TV is Sub-Sea Systems, Inc., San Diego, Cal. (see cover). Hydro Products, Edo Western, Kinergetics, Video Sciences, Inc., Rebikoff Underwater Products, and others are also involved.

Fiber Optics

Fiber Optics is perhaps one of the last frontiers open to those seeking to maximize man's communications in the sea. Because of current knowledge regarding light's use in sound transmis-

(Continued on Page 17)

sion, a new era of communications has dawned. One company working in the research and development of this new technology applied to the telephone industry is Bell Telephone Laboratories.

In March Bell awarded a multi-year contract to Simplex Wire & Cable Co. for the continued development of optical communication cable suitable for deepsea application. The advantages to the telephone industry of using fibers with diameters less than 0.015" are many. A cable with such fibers can carry up to 24,000 separate channels. Increased capacity, security from electronic monitors and near immunity from electrical interference are all advantages of the new cables, once they are exploited to their full capability.

Another company also on the cutting edge of developing the new technology is International Telephone and Telegraph Company (ITT).

Talking to ITT is an education in the complexity of sophisticated communications of the 1980s. Far from concentrating solely on the undersea applications of the technology that enables the transmission of everything from digital signals to voice and video, ITT has detailed personnel in at least three installations to look at the possibilities, which are just beginning to be known.

One of ITT's first dramatic achievements occurred in 1977, when the company unveiled a system featuring hair-thin fiber optic strands, capable of monitoring the physiological condition of deepsea divers, and lasers. The "health" link permits a number of body functions to be monitored. Each of the input signals is digitized for transmission and decoding at the surface. Three electro-optical channels comprise the cable, which is scarcely thicker than a pencil. One downward link and two upward each are from 80-100 m long, all digital with 20 metabit capability. The downward and one upward link are FM modulated. The third fiber enables the monitoring of physiological functions of the diver.

In this early version, the lasers are pulsed, a method which had inherent power restrictions. The power could effectively be "on" for only something like 20% of the time. (In more recent versions lasers may be linear and run continually, using frequency multiplexing available 100% of the time.)

Today fiber optics are being tested for a myriad of uses. Some of the most encouraging developments of recent time are refinements in long optical wavelength technology, according to Jack Freeman, Product Line Manager, ITT Electro-Optical Products Division, Roanoke, Va. Whereas previously optical attenuation amounted to 4-5 dB/km at 0.84 micro meters, now it amounts to more like 1 dB at 1.3 micro meters. With one-fifth the attentuation levels of before, the efficiency of the fiber optics as a transmitting medium is clear.

The applications of such optics might include an optical transmitter or receiver, which would be part of a communications system that could link computers over long distances.

Undersea applications of fiber optics were the subject of a paper presented last summer by D. J. Albares of the Naval Ocean Systems Center, entitled "Military Fiber Optics Applications." The paper was presented at a meeting of the Society of Photo-Optical Instrumentation Engineers.

In it Albares said, "Fiber optic features of wide bandwidth and small size and weight make it attractive for replacing electrical cables in undersea telemetry such as sonobuoy, torpedo, surveillance, and work systems. The undersea mechanical and environmental conditions are harsh compared with other long run applications including pressures up to 10,000 psi, mechanical tensions as high as 30,000 lbs, and cable bending under load in some cases.

"Several prototype cables have been produced including a 1.7 cm diameter tow cable, a 1.5 mm diameter cable for sonobuoy use, and a 1 mm diameter cable for guided torpedo application. The sonobuoy system for example transmitts at 50 kb/s over 5 km. The fiber optics eliminates impedance changes experienced during unreeling of present electrical wire as well as short circuits which can occur through pinholes in the electrical insulation.

George Wilkins of the Naval Undersea Systems Center, Kailua, Hawaii, recently presented some results at the San Diego meeting of the Marine Technology Society Undersea Cable and Connector Committee regarding his organization's work with fiber optic cables. He told Sea Technology that with long wavelengths up to 1.27 microns, it is now possible to transmit through cables 0.1 in. or less in diameters, with full duplex signal mode, enabling simultaneous sending and receiving.

At NUSC optical cables have been pressure tested to 10,000 psi with little attenuation, and cables have been flexed up to 20% of their breaking strength.

Coaxial cables typically deteriorate after a few thousand flexure cycles, according to the lab's experience. But those tested by NUSC were still serviceable after 500,000 flexure cycles. They were made by a vendor for test purposes.

An article appearing in Electronics Letters for August 1978, by Horiguchi, deals with spectral losses in low hydroxide optical fibers. It shows that attenuation is at a minimum in some of his tests, amounting to 0.47 dB/km at a wavelength of 1.27 microns.

A second article in the same publication is co-authored by five Japanese scientists and deals with a non-repeatered 50-km transmission using low loss optical fibers, a composite strand, 53.3 m long, comprised of several separate lengths of fiber. The "continuous" strand performed at a rate of 32 megabits/second, a high data rate considering the bit error rate of 10^{-9}, or one erroneous bit in 10 billion. This is compared to conventional coaxial cable, where the bit error rate is comparable, but such performance is extremely unlikely with transmissions over 11 km at 6 MHz at the rate of approximately 9 megabits/second.

Conclusion

It is clear to any observer that the underwater communications field is in a state of flux. New technology is appearing as fast as previous technology is refined. Experimentation with fiber optics techniques is beginning to yield surprisingly low attentuation levels in comparison with what was available only a few years ago. Human engineering factors are continually being assimilated into the communications package delivered to users. All these things are leading to better coordination between the surface and the diver or submersible—which spells a higher level of safety for man in the sea. ☐

Friday, June 15, 1979

THE SAN DIEGO UNION B-9

Animals Thrive In Deep Ocean Heat

By CLIFF SMITH

Science Writer, The San Diego Union

Scientists have found animals thriving on the ocean floor in incredibly hot water — water they believe to be at least 40 degrees Fahrenheit warmer than the highest temperature at which any other animal can survive.

Dr. Robert Hessler of Scripps Institution of Oceanography, an internationally recognized authority on deep ocean animal life, told a press conference that he and associates found worms basking in submarine springs of a temperature thought to be at least 80 degrees centigrade (176 degrees F).

This is a temperature so high that it breaks down the structure of the proteins of most animals.

"The hottest you ever find any kind of life at all is about 60 degrees centigrade (132 degrees F.), even in hot springs," Hessler said.

"If we can demonstrate they (the worms) are living at 80 or 90 degrees centigrade, this is really new and important. We are learning that there is a way of putting together protoplasm to survive conditions that we have never seen before."

The two- to three-inch-long black worms are properly known as polychaetes and their relatives are common to all marine environments.

The scientists just back from an expedition to the springs nearly two miles deep off the tip of Baja California, however, have dubbed the hot water creatures "Pompeii worms" because their environment is reminiscent of the ancient Italian city buried alive by an exploding volcano in 79 A.D.

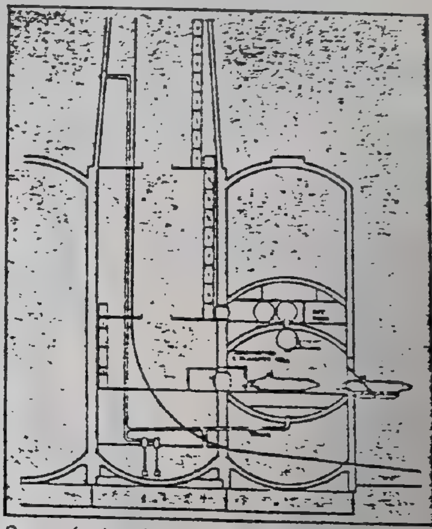
Hessler and scientists of several other institutions dived in a three-man submarine to investigate the geodynamics of a rift in the ocean floor where new crust is being formed out of the Earth's interior and to probe the rich communities of animal life at springs in the fracture zone.

The animals included red tube worms up to 10 feet long and 15 times normal size, crabs that swim through water vents far higher than the boiling temperature at sea level. fish. anemones. worms that look like piles of spaghetti, large clams and a species of barnacle never seen before even in fossil form.

Hessler agreed that the deep ocean life colony was the most important discovery in deep sea biology since the English research ship H.M.S. Challenger established the existence of any kind of deep ocean life more than a century ago.

"This is the first new (animal) community that has been discovered since the Challenger," he said.

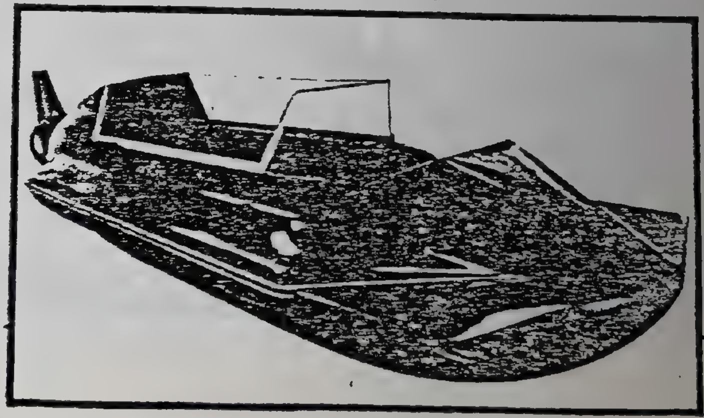
The uniqueness of the colony, he explained, is that it is the first found on Earth that does not ultimately depend on plant photosynthesis.



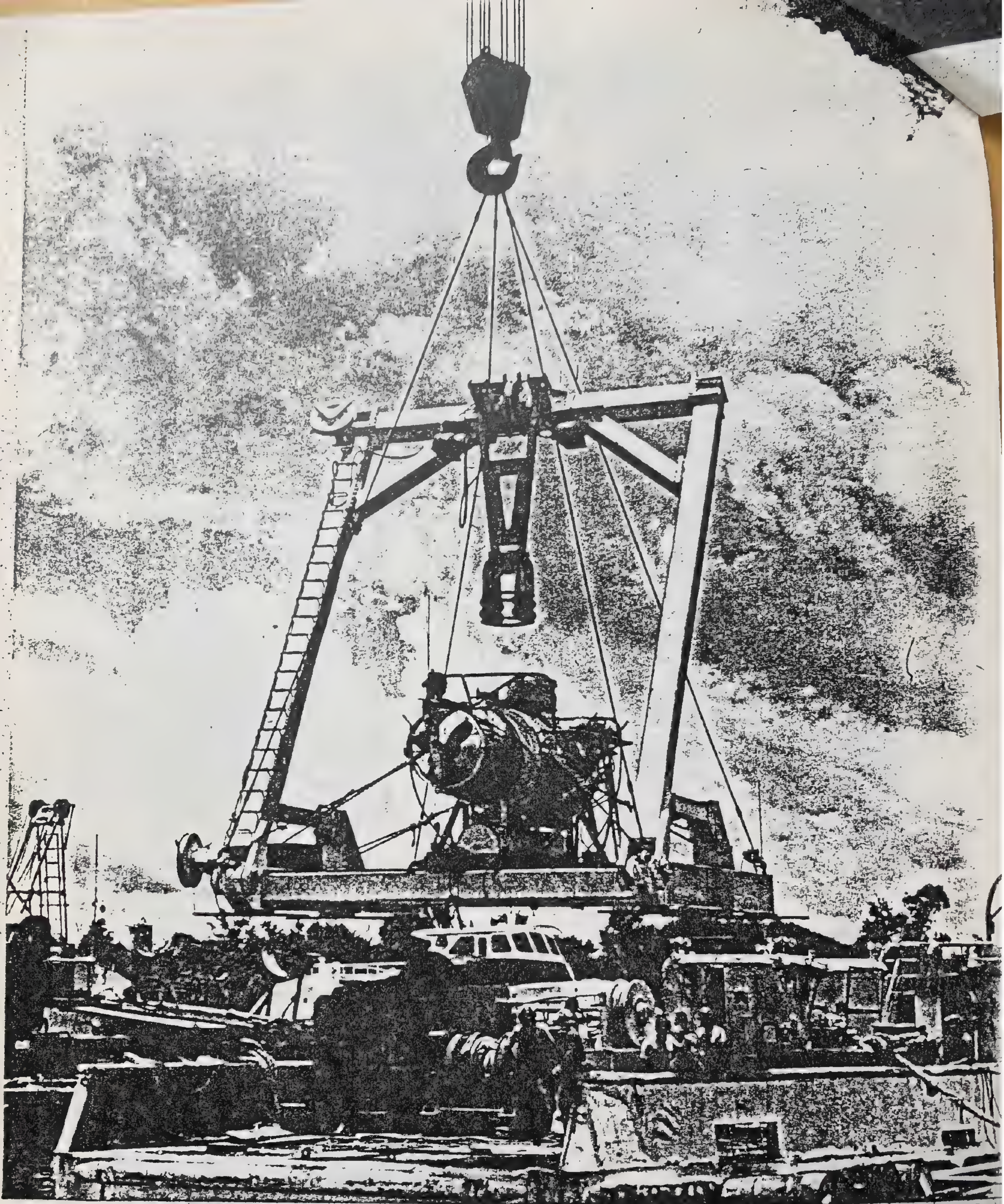
One of the interesting elements in the Norwegian Contractors new design is a provision for a submersible. RCV and bell station half way down one of the legs

Underwater transportation was packaged at around $17 000 (approx £8500) in the form of the DDV-300 mini-submarine from Underwater Propulsions, Inc., large enough to seat four divers and available in a range of colours.

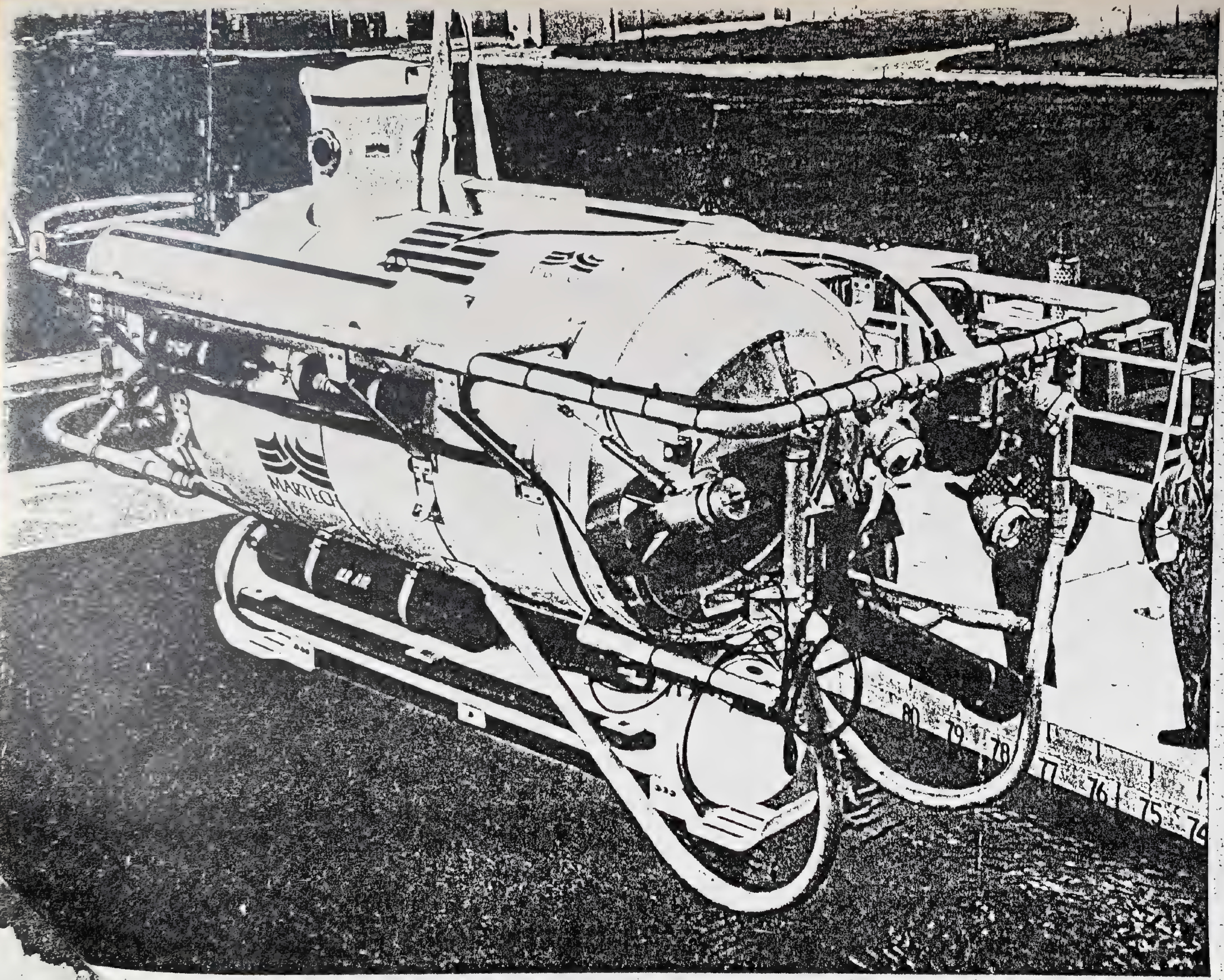
InterSub is expected to pick up some of the equipment left aside by the purchasers of the former Vickers Oceanics submersible business. The new company—owned by the National Enterprise Board, Brown & Root and Wharton-Williams—is to be known as British Oceanics and will comprise a smaller staff than the former Vickers Oceanics. It will retain the lock-out submarines and three mother ships, leaving two other surface support vessels for sale along with one or more inspection submarines.



Smart way to keep up with the undersea Joneses—the DDV 300 sub



MARTEK PIONEER I AND HANDLING GEAR ON R/V RAINBOW


MARTECH
80
79
78
77
76
75
74

MARTEK SUB PIONEER I

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

SEPTEMBER, 1979

Vol. XIII, No. 3 Published by the Deep Submersible Pilots Ass'n

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to:

Robert K. R. Worthington
Editor & President, DSPA
3005 Curie Street
San Diego, CA 92122
(714) 453-1158

Donald E. Saner
Secretary, DSPA
4707 Berwick Drive
San Diego, CA 92101
(714) 278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman, DSPA
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

The Marine Technology Society Journal for December '78-January '79 was a "Special Submersible Safety Issue" and contained much of great interest to DSPA Members, naturally. My copy just surfaced in my stack of journals, somehow having submerged on receipt without attracting my attention. I hope you are all MTS members and received a copy. It is far too voluminous for me to reprint, of course; but perhaps you can find it in your technical library.

Attention of Members is called to the provisions of Article IV of the DSPA Constitution regarding "Termination and Reinstatement of Membership. Although not specifically pointed out therein, there is no requirement that a Member must resign because no longer employed in submersible piloting. In fact, most of our Members are no longer actively piloting, and many are in diverse employment. Only one of our present officers, Don Saner, is still piloting. As long as you maintain an interest, we hope you will retain membership. In fact, in addition to the provisions of the Constitution, the Board has recently decided that any Member temporarily unemployed and financially strapped will , on request, be carried "on the cuff", without payment of dues until re-employed.

Regarding employment in this fluctuating underseas industry, it is desirable that Members advertise their availability in the NEWSLETTER by means of a letter to the Editor. Furthermore, I am asked from time to time by non- members to suggest names of persons to fill given job requirements. Members who become aware of job openings are urged to keep me informed for the benefit of other Members.

The MTS Exposition & International Conference on "Ocean Energy" will be held in New Orleans on October 10-12, 1979. There will be sessions on "Submersibles" and "Submersible Future Requirements".

SECRETARY"S REPORTS & NOTICES

DSPA Annual Meeting --OCEANS '79, a symposium on "The Technical Challenge of Inner Space, is programmed for 17-19 September, 1979 at San Diego, California. It is jointly sponsored by the San Diego Sections of IEEE and MTS. On Tuesday, 18 September, two sessions on "Underseas Vehicles" will be held. On the completion of the afternoon session, there will be a meeting of DSPA Members and guests. Deep submersibles ALVIN, AUGUSTE PICCARD, DEEP QUEST, AND NEKTON will be available in San Diego for visits during the week of this Symposium upon arrangement with their crews.

1979 Dues still in arrears are as indicated below. This constitutes a final notice. If you believe an error exists in the record, please communicate with Treasurer Shiller.

Donnelly	$5.00	McQuown	$10.00
Fisher	10.00	Merritt	10.00
Keach	10.00	O'Donnell	10.00
Martin	10.00	Plancon	15.00

All hands are again urged to pay dues promptly. It is an imposition to require DSPA officers to issue reminder after reminder every year.

DSPA San Diego Luncheon Meetings

6/19/79---Met at 1145 at Tarentino's.

Members Present	Non-Members Present
Bob Worthington	Ken Privitt-MARFAB
Don Saner	Craig DeWeese- "
Will Forman	Pete Traphagen-NEKTON, Inc.
Jerry Shiller	Tod Slaughter-AUGUSTE PICCARD
Jack Bennett	Fred Wagner- "
Doug Privitt	
Merle Wilson	
Don Rosencrantz	

Bob Worthington reported that ALVIN/LULU personnel had been expected to be present but had gone to sea despite LULU engine troubles. The July luncheon date will be scheduled to meet their schedule , if possible.

Doug Privitt has a copy of the revised ABS Rules for Building and Classing Underwater Systems and Vehicles and recommends all hands obtain a copy for their edification/amusement.

Jack Bennett reported that PICCARD has a contract to test the Lockheed Power Cell for Lockheed. As usual, cell packaging, etc., makes it obvious that the designers did not take advantage of the readily available consultation with DEEP QUEST personnel to adapt the Power Cell to the real world of seagoing deep submersible vehicles.

Bob Worthington announced Alan Whitfield's call for speakers at his Safety Seminar in London next February 12.

Next meeting will be in mid-July.

7/13/79---Met at 1145 at Tarentino's.

Members Present
Bob Worthington
Merle Wilson
Doug Privitt
Don Rosencrantz
Carroll Hoyt
Chris Landrum
Don Saner
Larry Shumaker
Jack Bennett

Non-Members Present
Craig DeWeese-MARFAB
Ken Privitt- "
Pete Traphagen-NEKTON
Al Smith-DEEP QUEST
Gary Saner-USN
John Snooks-Australia
Mike Muirhead-
Dave McCafferty-TRANSQUEST
Mel Wills- "
Tom McGinlay-Naval PG School
George Ellis-ALVIN

Carroll Hoyt reported that R/V SEAMARK is at Ketchikan with two bent propellers sustained by contact with floating logs while enroute to operations in the Gulf of Alaska. ANEKTON diving operation in Lake Michigan is being mobilized.

Chris Landrum was welcomed on board as a new Associate Member. He is working for Lockheed Petroleum Services as a capsule operator in the oil fields off Brazil. Formerly, he was a DEEP QUEST electrical/electronics tech.

George Ellis(ex-TRIESTE) is now an ALVIN PILOT. He reported that LULU plans to depart San Diego for ALVIN ops on 19 July.

At 1315, the meeting adjourned to the Scripps Nimitz Lab for a guided tour of LULU and ALVIN. George Ellis served as guide and provided an account of recent scientific dives of ALVIN, undoubtedly most fascinating deep submersible ops underway in the world today. Watch for a National Geographic feature article soon.

8/20/79---Met at 1145 at Tarentino's

Members Present
Bob Worthington
Will Forman
Don Saner
Jack Bennett
Chris Landrum

Non-Members Present
Ron Rau-Lockheed

After discussion of the prospective DSPA Annual Meeting on the occasion of OCEANS '79 at San Diego, it was decided that the meeting would be held following the afternoon session on "Submersibles" in the same meeting room if available or in space to be arranged by

Jack Bennett. An announcement is to be made at the morning and afternoon sessions on "Submersibles on 18 September, 1979.

Jack Bennett agreed to make "Piccard" available for visitin at Harbor Boatyard, and Don Saner did likewise for DEEP QUEST at Lockheed Ocean Lab at times to be announced at OCEANS 79. ALVIN will be in port at the Nimitz Lab pier and also will be available.

Chris Landrum described the problems experienced in oil field operations off Brazil. He has been able to spend several extra weeks at home in San Diego while undergoing STRAZA training for operation of the SCORPIO ROV purchased by Lockheed Petroleum Services.

Will Forman regaled with an account of his past two months in Mexico while improving his Spanish.

Jack Bennett described PICCARD's successful use of her TREC while underway submerged.

Bob Worthington read letters recently received from Olsen, Megow. Whitfield, Parker, Boulton, and Irene Fager.

Phillippe Cousteau-died in the crash of his plane off Portugal in June. The DSPA sent a telegram of sympathy to the Cousteau family and the crew of CALYPSO via the Cousteau Society in New York.

REPORTS FROM MEMBERS

Irene Fager (6/25/79)

-Re Honorary Membership--"I am pleased beyond words and I thank all for their understanding and consideration.--Your card states that I am an "Honorary Member"only through 1999. Since I will only be 79 years young at that time, I am wondering why the restriction. I have every intention of doing ONE HALF FATHOM from my wheelchair if necessary.--I really do enjoy my association with your group and I hope that you all feel the same about me and ONE HALF FATHOM. Our group holds you all in the very highest regard."

Kevin Parker (7/9/79)

I now work for Oceaneering as an "Arms"pilot. Just now I am on Arms 3, which, along with the FERNSTAR, the semisub we are working with, has just completed a drilling operation about 240 miles N W of Bergen. Shell has now bought the rig and has called it the BORGNY DOLPHIN. We are now on passage to a new site in 1200'waters.--I recently spent some weeks working on the ORCA. My immediate reaction to its size and complexity was "wait till it goes wrong", but it has proved to be very easy to handle and has developed a reliability which I wish some subs had. I feel it is generations ahead of other R.C.V.'s and its stability makes it an ideal platform for the General Electric Arm. I'm sure there are going to be quite a few more ORCA's swimming around--Things appear to be moving over here again. Indeed, one sub firm has had to advertise in the national press in order to get pilots.

Only a few weeks ago (so it seems), there were (what's the collective name for a group of pilots-school, pride, mob, thicket?) lots of people knocking on doors asking for jobs. Now, perhaps there will be work for us all again."

Steve Boulton (8/3/79)
"It has been a particularly hectic year for me since I left Vickers Oceanics, and, to be honest, the future does not look any brighter regarding the work load.--The reason for this is that I have just formed a partnership with two ex-colleagues from Vickers Oceanics, and we have formed a new company called HMB Subwork Ltd. Basically, we will be concentrating on operations using the Mantis one-man tethered submersible (built by OSEL of Great Yarmouth), and a lot of interest is being shown in this venture at the moment.--We have just been involved, as the operating company, in the recovery of the wreckage of the Tornado fighter that crashed in the Irish Sea in June, and very happy to say that Mantis performed extremely well during this operation, being responsible either directly or indirectly for the major share of the debris recovered. --I will try and write you again in the near future-----and give you more information reference HMB Subwork and Mantis operation."

Rick Olson (8/9/1979
"I am starting back to school this fall with a full load at Mesa College and hope to transfer to UCSD in a couple of years and major probably in engineering, Anyway, it looks like I've got my work cut out for me.--Keep me informed of what's going on; maybe now I'll have time to participate in some of your activities.

Jim Beachler (8/20/79)
"I assumed the duties of Chief-of-the-Boat on board USS SEAWOLF (SSN 575) in May of this year. The ship is presently being overhauled in Mare Island Naval Shipyard at Vallejo, California. Hopefully, I will be able to re-enter some phase of the deep submergence field after completion of military service"

Joe Kishel (8/26/79)
"Please remove my name from the DSPA membership list. I am no longer employed in the diving industry or involved with submersibles since I left Deep Diving Systems 15 months ago"

Larry Megow (6/5/79)
"attached is a brief summary of the highly successful 1979 Offshore Technology Conference.--We were able to collect only three DSPA pilots for an unofficial meeting- John Bennett, Thomas Vetter, and me- but we did enjoy swapping experiences.--I will be in San Diego for an ASME PVHO (Pressure Vessel for Human Occupancy) meeting on 18 Sept. Sure would appreciate your scheduling one of your DSPA luncheons on the 17th. I'll even host the luncheon. How about that!--You should all be aware that ASME/ANSI have published a document "ASME Safety Code (PVHO) on Pressure Vessels for Human Occupancy PVHO-1",

in October 1977, obtainable from the ASME, United Engineering Center, 345 E. 47th St, New York, NY 10017. I think the price is $15.00."

REPORT ON THE 1979 OFFSHORE TECHNOLOGY CONFERENCE

By

Larry Megow

The highly successful 1979 Offshore Technology Conference which closed May 3rd at Houston's famed Astrohall and Astrodome, hosted a record attendance of 78,668 engineers, educators, scientists, divers and executives from 90 countries.

Approximately 2,000 companies from 22 nations displayed millions of dollars in equipment devoted to the development of offshore resources, protection of marine environment, solutions to the world's energy problems and to exchange theories on all facets of offshore activities.

Renowned speakers (including His Highness, the Duke of Kent), from 25 countries presented 325 papers on offshore resource developments.

The OTC, now committed to return to Houston through 1983, has become the world's largest and most comprehensive technical conference and exhibition of offshore equipment.

A minimum of 6 hours of slow walking was required just to traverse the miles of aisles and the more than 450,000 square feet of floor space covered with the thousands of equipment displays.

If you missed this 1979 OTC extravaganza, plan to attend the even better 1980 OTC in Houston.

(6/26/79) "Send information on the IEEE '79 September 17/19 Conference. I may want to attend.--I am happy to hear that 'our' ALVIN and her LULU are in San Diego. I just may be able to say hello to her, too.--I sure would appreciate it if I could make even a shallow dive while I'm in San Diego - in any of the boats. Maybe in TURTLE, SEACLIFF, OR DSRV. --Ross Saxon says he isn't lost at all - says he sent you a long letter."

(7/24/79) "I don't know if the attached article from the Washington Post on a Soviet super sub is appropriate for our publication, but I think it will be highly informative and very interesting to many submersible pilots."

SOVIET SUPER SUB

Writing in the Washington Post of May 18, George C. Wilson, citing government sources, reported that the Soviet Union has developed a nuclear powered attack submarine that can go faster and deeper than any U.S. submarine. Supposedly built of titanium, the new Soviet submarine is believed to be about 3,500 tons, can develop a submerged speed of 40 knots and can dive to 2,000 foot depths. Its nuclear power plant is said to produce more horsepower per pound of its weight than comparable U.S. power plants, but it is noisier than the engines of American submarines. The U.S. Navy attack submarines of the Los Angeles class displace 6,900 tons, have a submerged speed in the area of 33 knots, and their diving limit is nowhere near that attributed to the Soviet sub. Wilson believes that the evidence of Soviet submarine development may be used to assult Admiral Hyman G. Rickover's hold over U.S. Navy submarine development. Further, there have been reports of interest among Navy submariners in smaller submarines, and even in submarines equipped with other than nuclear power plants in an effort to cut costs and increase the numbers of American submarines.

(8/3/79) "The story about Houston based unmanned submersible TREC's "derring-do" dive in attempting to aid in stopping the 30,000 barrel blow-out in the Gulf of Mexico on June 3, 1979, should be exciting reading for your (our) readers.--MARTECH's manned sub PIONEER I was also involved in the spectacular offshore fire. At one time, the TREC was also blown to the surface by the vortex caused by suction of the escaping oil. Bob Robertson with MARTECH should be able to provide details.

MARINE
TECHNOLOGY
SOCIETY

SUBMERSIBLE SOUNDINGS

A Newsletter of the MTS Professional Committee on Undersea Vehicles
No. 9 -- June 1979

TO   : (a) Marine Technology Society Professional Committee on Undersea Vehicles
           (b) Vehicle Builders and Owners
FROM   : Frank Busby, Acting Chairman
SUBJECT: Semi-Annual Meeting, Wednesday, 2 May 1979

The semi-annual MTS Undersea Vehicles Committee meeting took place in Houston this year at the Offshore Technology Conference. Forty-six people attended and the meeting terminated after three hours only because the afternoon OTC session forced us to vacate the room. Attachment (1) is a list of the attendees, if your name or address is spelled incorrectly, please excuse us, it is difficult to interpret the wide variety of penmanship from the list we circulated.

OVERVIEW

Our committee chairman, Joe Vadus, presented an overview of Manned Submersible and Remotely Operated Vehicle (ROV) activities - which MTS is involved in, and a general view of the field as the National Oceanic and Atmospherica Administration (NOAA) sees it. Briefly, his summation included the following:

---The MTS USV Committee consists of over 100 members from 11 countries. The Committee is sub-divided into four sub-committees: Manned Submersibles, ROVs, Underwater Habitats and Future Requirements.

---In the area of ROV's, NOAA's Office of Ocean Engineering is conducting an assessment of vehicle capabilities, design, construction, problems encountered and research/development programs. The study should be finished this summer and Joe promised to send a copy of the report to all committee members. He also stated that to assure you get a copy, please send him a request on company letterhead stationary. The address is:

Office of Ocean Engineering
Code OE-2
6010 Executive Blvd.
Rockville, Md. 20852

---A paper, extracted in part from preliminary results of the above study, was presented by Joe at a one-day seminar in London sponsored by the U.K.'s Society for Underwater Technology. The paper contained the following highlights:

a) In the last two years the number of ROVs has tripled.
b) There are over 166 ROVs (operational and under construction) around the world. (This includes: tethered, free-swimming vehicles of the CURV variety; bottom crawlers such as SEA BUG; towed vehicles such as DEEP TOW; and untethered vehicles of the SPURV variety.)
c) In fiscal year 1978 U.S. undersea vehicle activities, excluding the military, involved the use of manned systems for 510 dive days. ROV operators (only half responded to an inquiry) reported 2,007 dive days.

---NOAA's approach to ROV technology is to analyze the principal NOAA mission and operating requirements, and to determine the extent to which technology developed by industry and the Navy is applicable. In the near term, efforts will be directed toward development of mission oriented technology which can be incorporated into an ROV system. Current projects include: digital side looking sonar, sub bottom profiling and sea bed sampling and analysis techniques.

---NOAA plans include leasing an existing ROV for use in a future NOAA undersea research mission (summer of 1979), which involves submersibles and divers. This will enable obtaining some preliminary evaluation data relative to ROV performance and suitability in scientific research missions.

---There are no NOAA plans, at this time, to develop or adapt an ROV system for scientific research. If such plans develop in the future, the ROV approach will include integrating mission-oriented technology currently under development.

---Joe also described one particularly interesting U.K. effort at ROV research/development. At the SUT seminar in London, Mr. David Partridge of U.K.'s Department of Energy presented Government views on future research and reported on a new Department of Energy initiative to encourage research in automation underwater through the recently formed Advisory Group on the Technological Developments Necessary for the Progressive Replacement of Man Underwater (AGPRMU). The group is chaired by Sir Hermann Bondi, Chief Scientist of the Department; and includes members from the underwater industry, other relevant branches of engineering science, and the academic community.

---For future planning on Society Conferences: In August 1980, IEEE will go to Seattle as OCEANS 80 (West), and MTS will go to Washington, D.C. in September 1980 as OCEANS 80 (East). MTS and IEEE will participate jointly in OCEANS 81 in Boston and in OCEANS 82 in Washington, D.C.

---As a reminder: the next MTS USV committee meeting will be at MTS OCEANS 79 in New Orleans, October 10-12.

---The last subject was the tenure of my Chairmanship of the USV Committee which will last through 1979 while Joe serves as Vice President for MTS Technical Activities.

SUBMERSIBLE SAFETY STANDARDS

John Pritzlaff summed up the status of the MTS handbook on safety standards: the handbook is in the final stages and John has, except for extraordinary reasons, "frozen the design". The standards will be published in July 1979 and are available from MTS in Washington for about $20.00 apiece.

ABS - While on the topic of submersible standards, John Reiter, of the American Bureau of Shipping, asked that the membership be made aware that the ABS Rules for Building and Classing Underwater Systems and Vehicles have been published. These Rules present the requirements and procedures for the classification of underwater systems. Underwater systems are defined as submersibles, diving bells, habitats, etc. The classification of diving systems including the diving bell and other components such as umbilical lines, gas control equipment, gas storage facilities, deck decompression in chambers; or launch and recovery systems. As an alternative, a diving bell may be individually classed and other components individually certified in accordance with provisions given in appendices to the Rules. The new Rules replace the Guide for the Classification of Manned Submersibles published by ABS in 1968. The Rules sell for $15.00 in the U.S.A. Shipping costs added in other countries. Orders may be sent to:

Book Order Section
American Bureau of Shipping
65 Broadway
New York, New York 10006

REMOTELY OPERATED VEHICLES

The ROV sub-committee has a new chairman, Mr. Drew Michel of Taylor Diving. This sub-committee, in view of the tremendous activity in ROVs should pick up speed in the next few months. An example of the growth in this area is shown in Attachment (2), the data of which is taken from the forthcoming NOAA study of ROVs. (If anyone spots an error in this figure, please let me know what it is.) One of the first suggestions was the desireability of MTS conducting a study into the standardization and safety of ROV operations. This suggestion met rather strong criticism from the members present, and, for the near-future, the idea will be shelved. Drew has expressed a desire to give the sub-committee some new direction, anyone who would like to help him or has some ideas regarding what are appropos subjects for the sub-committee to tackle is cordially invited to contact Drew, his address is in Attachment (1).

FUTURE REQUIREMENTS

Gene Allmindinger, University of New Hampshire presented a brief review of the forthcoming topics at the New Orleans, OCEANS 79 meeting. Two sessions are scheduled, one will address advanced technology for manned and remotely controlled submersibles; the second will concentrate on future requirements in the undersea field. The papers presented represent an international viewpoint of the industrial, government and academic community.

AROUND THE ROOM

Our traditional "around the room" session was cut short this year. Owing to lack of time - caused by diversion into the negative and positive aspects of ROVs - many of the attendees, unfortunately, did not get a chance to talk. In any event, the following comments did get a chance to reach the floor.

Ted Rice, Bruker Physik AG - Two MERMAID VI's have been sold, two more are under construction. The buyers of these vehicles do not wish, at present, to reveal their names. Bruker Physik is also designing a SUBCAT, it is in the final engineering phases.

J. Dawson, Undersea Projects Insurance Brokers Ltd. - Discussed the potential use of ROVs in the marine insurance business. He felt is would be of great assistance in assessing damage to vessels prior to drydock.

D. Rebikoff, Rebikoff Underwater Products - Has established a school of operators of remote vehicles and instruction for maintenance equipment. He discussed the problems inherent in finding suitable personnel.

Jack Bennet, Gulf Maritime Explorations - The AUGUSTE PICCARD has been chartered by Gulf Maritime and has moved from Vancouver, B.C. to San Diego where it is undergoing sea trials and demonstration dives. They have replaced the sail with bow thrusters. (I interjected that the Continental Group is joint venturing with Horton Maritime to provide a lithium sea water battery for AUGUSTE PICCARD. The program is divided into two phases: Phase I (which will be completed this year) will increase power duration to 1.2mWh; Phase II will provide 36mWh.)

Bob Morley, Ferranti Offshore - Discussed the development of an inertial navigation system for submersibles and questioned if they should also look for application to ROVs. He discussed the attributes of the system, i.e., error oscillation is within 1m and altitude is within 1 minute, however, he also discussed the constraints in achieving such accuracy.

Alan Coureau, Managing Director of Intersub - They are negotiating to buy four submersibles and two support ships from Vickers. Currently they are using two inertial guidance navigation systems. They recently purchased a TROV vehicle and will use it on pipeline surveys. The TROV support ship has two computers which allows it to work 18-20 hours/day to reduce cost. One-third of their work is in the Mediterranean, with the balance in the North Sea.

D. Girard, CNEXO - They are building a submersible, SM 17, designed for 6,000m depths. It will be a 3½ year program. CYANA has been improved and has two scientific jobs this summer, one in the Atlantic Trench the other in the Bay of Biscayne. EPAULARD is on sea trials. It is an acoustically controlled ROV with 6,000m maximum depth. Today it is being used in 2,500m in the Mediterranean.

Dick Frisbie, Solus Ocean Systems - Described some of the work they did with TROV last summer on a deep water survey. Could not determine what the vehicle can do since they encountered clump problems due to winch inoperability. The current (i.e., cable drag) seems to be more limiting than depth. The umbilical cable needed to do all the tasks required is large and the sub uses a great deal of power just to drag it around. (Bob Hittlemen, Hydro Products - remarked that they recognized the design problem and used a launch cage (clump) which increases cost, but permits more flexibility in use.)

Andy Anderson, Sub Sea Surveys - The PC5 is in the Bruni Shell Field operating at 300 ft, PC8 is in the North Sea, and its support ship CAPALONGA (5,000T) has been modernized. They now have two one atmosphere bells with manipulators (1 under construction) one operating in the Mediterranean.

255 Alhambra Circle #650
Coral Gables, Fl 33134

Deep Ocean Work Boat (DOWB) built by General Motors is about to undergo remodeling. Southwest Reasearch Institute of San Antonio, Texas will perform the work.
A new 36" window will replace old optical system.
Provision is being made for one atmosphere transfer of personnel at 4,000 feet.
Optional Crawler...120 Horsepower via umbelical to surface vessel, powering Dozer Blade, Back hoe, Jet trencher. DOWB can mate and unmate at will. All controls from within DOWB.
Whatever the work, wherever the job, DOWB and its Crawler gives better capability to produce results= faster, surer, safer. And deeper.

Russell L. Law, Jr., President
Friendship, S.A.

Two die after rescue from North Sea floor

Associated Press

LERWICK, Shetland Islands — Two Americans who had been trapped 17 hours in a diving bell on the North Sea floor died yesterday, apparently while undergoing decompression after the bell had been brought to the surface, the British National Oil Corp. (BNOC) said.

Officials of the state-run oil company said that the bell's air line had remained intact after the bell had plunged to the sea floor. There was no elaboration on the circumstances of the men's deaths.

BNOC said that the bell's support cable snapped early yesterday as the men were examining an offshore oil well, dropping the bell to the sea floor, 500 feet below the surface.

Officials said that the men would not be identified until their families had been notified. They were employed by Infabco Diving Services of Aberdeen and were working under contract to BNOC in the Thistle Field, 130 miles northeast of the Shetlands.

The British Department of Energy and the Aberdeen Police Department said that a full investigation was planned.

A massive rescue operation had been mounted to save the men, officials said. A first attempt to connect a cable to the bell had failed, but a second was successful. The bell was hauled up, and a special decompression chamber to bring the men's systems back to sea-level pressure was affixed, BNOC officials said.

There have now been at least 32 divers killed in North Sea oil fields since operations began there in 1971.

Friday, June 29, 1979

Cousteau's Son Phillipe Killed In Plane Accident

ALVERCA, Portugal — A seaplane piloted by Jacques Cousteau's son Phillipe clipped a sand bank while landing yesterday, capsized and sank in the Tagus River, drowning the 37-year-old son of the noted French oceanographer, police in this Lisbon suburb reported.

Police said seven persons escaped from the 33-year-old plane, but despite rescue efforts by fishermen, Cousteau drowned at the controls.

The surviving crew members, two Frenchmen and five Portuguese, reported they were stunned by the collision. They said they thought Cousteau might have hit his head and lost consciousness when the plane flipped over.

One survivor, 25-year-old Cousteau diver Den Phan, told reporters the plane went tail-over-nose about five seconds after coming down on the water at the end of a test flight.

One of the crew broke an arm and another was hospitalized for shock. Jacques Cousteau was reported en route to Lisbon to claim his son's body and accompany it home to France.

The World War II craft had been undergoing repairs here for several months and was purchased in 1974 by Jacques Cousteau to film bird migrations and study river courses.

Phillipe Cousteau is survived by his wife, Jan, and daughter, Alexandra.

—AP

))) ***North Sea Dynamically Positioned Diving Systems May Be Banned.*** Operators of diving systems that are dynamically positioned have been warned by the British Energy Department officials that they must improve their safety record if they are to keep operating. They were told that if there isn't any improvement the systems could be banned from United Kingdom waters. . . .Such systems feature diving bells in which the divers are lowered and raised and out of which they work on the bottom. Energy officials investigated an incident where two divers died in a bell operating from the vessel *Star Canopus* and another near miss incident where two divers in a bell were hazarded by failure of the dynamic positioning system. ☐

CNEXO tries acoustic controlled submersible

Paris — CNEXO has carried out the first trial of a submersible controlled by acoustic sound rather than by a cable. In a trial carried out off Toulon last month in a depth of 2600 metres, *Epaulard*, a three-ton submersible designed by CNEXO, spent six hours on the seabed and travelled a distance of three kilometres. Four metres long, two metres high and 1.11 metres wide, the vehicle is to be tested in the Gulf of Gascogne next month in 4500 metres of water.

CNEXO says the *Epaulard* is designed for geophysical work and underwater photography. It is capable of travelling at one metre a second and can spend as much as eight hours under water. With only three hours required to lower and recover the submersible and charge the batteries, it can be used in eleven hour cycles. According to CNEXO, the great advantage of the acoustic control system, developed by CIT–Alcatel, is that it can be directed to an accuracy of ten to twenty metres. A cable controlled vehicle offers the possibility of obtaining real time data, but it is less accurate.

CNEXO estimates the submersible would cost 2.5 million francs, but a similar design for shallower depths could be cheaper. One of the more costly elements in the design is the syntactic foam hull which would not be necessary for use in shallower waters. The submersible, which was originally envisaged for metallic nodule prospection, may now be used for oil geophysical work. The vehicle is not suited for carrying out mantenance work.

Manned sub maker loses, unmanned wins

Vancouver — International Hydrodynamics Co of Vancouver BC is in receivership. According to vice-president David Doman "the future looks quite bleak to us." Last year HYCO's major customers, Vickers Oceanics Ltd and P & O Subsea went out of the submersible business. The four submersibles owned by P & O are still up for sale. HYCO owns two submersibles, of which only one (the Taurus) is paying its way. Another craft, the Pisces VI, has been sold to a US company for use aboard the *Discoverer Seven Seas*, the drillship on sub-charter to Texaco Canada Ltd, for the Newfoundland shelf. HYCO's Vancouver plant has laid off 120 of its staff of 165.

On the other hand, International Submarine Engineering Ltd of Port Moody BC has recently completed the best year in its five year history. It produces the TROV (tethered, remote operated vehicle) of 6000 lb, and a remote camera (TREC). TROV sells for $500,000. According to president James Macfarlane, four TROVs and four TRECs have been sold in 1978, and "this year will be even better".

))) **One Submersible Rescues Another.** When CURV II, the unmanned recovery vehicle of the Naval Ocean Systems Center (NOSC), San Diego, Cal., tried to recover a piece of spent ordnance from a depth of 76 m it became entangled in the mooring line of an underwater buoy. As control personnel tried to entangle the vehicle the situation was complicated when the buoy imploded. Divers on the scene were unable to help due to the depth. So the Naval Facilities Engineering Command's *Snoopy*, a small unmanned submersible designed primarily to carry an underwater TV camera, was brought to the scene. It has no manipulator. NOSC personnel jury rigged a cable cutter that was designed for the Work Systems Package, offsetting its weight by adding syntactic foam to *Snoopy*. At depth it cut the buoy cable and CURV I rose to the surface. . . .NOSC's longtime facility at Lake Pend Oreille, Idaho, used as a calibration station for large scale transducers and hydrodynamic tests of underwater vehicles, was disestablished March 31. The facility and functions were transferred to the David Taylor Naval Ship Research and Development Center, of which NOSC had been a tenant. .

9/79

Navy Recovers Missile Lost At Sea During Test

An 18-foot Navy Tomahawk cruise missile that sank to a depth of 5,400 feet off the Southern California coast has been located and recovered, the Navy announced yesterday.

This was the second time the Navy has carried out such a recovery here. In September 1977, it recovered a Tomahawk between here and San Clemente Island from a depth of 600 feet.

The present search began Aug. 10, a day after the Tomahawk, built by General Dynamics-Convair, deviated from its planned flight path when it was launched by the San Diego-based nuclear submarine Guitarro during a test. A chase aircraft directed the missile into the ocean south of San Clemente Island, where it sank into a silted bottom.

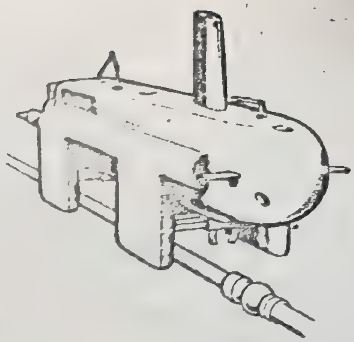
The Mystic, a deep submergence rescue vessel based at North Island, searched the area for about a week, but its depth capability is about 5,000 feet. A similar vessel, the three-man Sea Cliff, which can dive to depths of more than a mile, was called in last Monday, Capt. Charles MacVean, commander of Submarine Development Group One at Ballast Point, said at a news conference aboard the Transquest. The latter is a Lockheed Ocean Laboratory vessel that provided surface support during the search.

MacVean made a point of noting that most of the Navy's deep submergence rescue capability, which can be deployed anywhere in the world, is based in San Diego.

The Sea Cliff's officer-in-charge, Lt. Cmdr. Pat Elliott, said that on Tuesday, during the third dive, the Tomahawk was located by sonar and a line attached to it. After a bad-weather interruption, the submarine rescue vessel Florikan reeled in the Tomahawk Friday night. The missile was returned to the manufacturer to determine what went wrong.

The Navy said there have been eight failures so far in its 46 test firings of the Tomahawk.

The Tomahawk, scheduled to be deployed by the Navy in 1982, is a pilotless jet aircraft with a warhead. At sea, it is an anti-ship missile. On land, it flies about 100 feet off the ground, following the terrain over hills by the use of electronic sensors. It is programmed to locate and hit a target precisely at distances of about 1,500 miles. It is considered invulnerable because it can fly low enough to escape radar detection.



Sub for pipe line repair

Before long, a submarine capable of remaining at 350-m water depths for up to three days during pipe line repairs may sail 1,000 nautical miles independent of the mother ship.

The General Purpose Submarine for performing this task is the concept of Kockums Shipyard. The vessel's ability to remain submerged for long periods will allow the crew and divers to operate without concern for weather or sea state.

Storage batteries will be charged by using the same snorkeling system found in Swedish Navy submarines. (*Ocean Industry*, August 1978)

Medicine at Sea

[redacted] by the Bureau of Medical Services, Public Health Service (US Dept of Health, Education, and Welfare publication [HSA] 78-2024), 474 pp, with illus, US Government Printing Office, 1978.

This is the first revision since 1955 of a book that dates back to 1881. It is intended as a guide for officers aboard ship who may have to treat illnesses and injury without the aid of a physician or nurse. This, however, is more than a book on first aid. It is a textbook of primary medical care and is remarkably complete and detailed on how to diagnose and treat illnesses and injuries. Chapter 1 summarized the structure and function of the different organ systems, and chapter 2 is a most excellent description of how to take a medical history and perform a physical examination.

The illustrations are particularly good and clearly depict common medical procedures so that if occasion demanded they could be performed by someone with little medical training.

The chapter that deals with infectious diseases is complete because those who travel the world by ship are exposed to a great many infections seldom seen in the continental United States.

All drugs are described by generic name. However, a list of proprietary names is given in chapter 6, which lists all the medical supplies recommended to be aboard various types of vessels. Chapter 9 deals with birth and death at sea, and chapter 12 describes the medical signal code of the international code of signals. Although about one third of the book is devoted to information useful only aboard ship, the rest of the book is an excellent guide to first aid and nursing care either in the home or in a rural nursing station.

This book should be aboard every vessel that voyages out of sight of land and should take its place on the ship's bookshelf next to Bowditch, Chapman, and *The Nautical Almanac*.

InterSub dodges N Sea diving slump

London – While diving companies trim back their workforces to match a slow North Sea market, submersible operator InterSub is now working at capacity to meet demand on pipeline and platform survey and inspection work. Poor demand and weak prices drove both P&O Subsea and Vickers out of the manned submersible business last year, while in Canada International Hydrodynamics of Vancouver is reported discussing sale of its submersible assets. This month however InterSub, which may take over some of the former Vickers Oceanics vessels *(see EOPN 11/79, March 14, page 8)*, has all its support vessels at work and expects to be busy at least until August.

Intersub-1 started its first job of the season recently with platform inspection for Elf, which will be followed by a flowline route survey for Mobil on Beryl field where *Flexservice-1* is due to lay a Coflexip line in July. From there the mother ship goes to a two or three week pipeline survey on the main Ninian field pipeline.

InterSub-2 has been working on the Statfjord field since April, where the company has a two year contract with options to extend for up to five years. *InterSub-3* is working on jack-up pipeline supports in the Messina Straits off Sicily, where the pipeline route crosses on its way from the Algerian gasfields to Italian consumers. There will be more business to be won on this project later in the year when the submersible contracts to support the *Castoro Sei* are to be let, the charter probably stretching through 1980.

Mediterranean rivalry Competition for the pipeline laying observation work later this year and next will come from British Oceanics, the British Underwater Engineering division which took over from Vickers Oceanics. *Vickers Voyager* support ship is en route with two submersibles to assist with seabed rock blasting and another vessel will follow *(see EOPN 21/79, May 30, page 8)*.

InterSub-4 is working for Texaco on the Piper–Claymore complex until mid-July and then returns to the Shell FLAGS line to complete a pipeline inspection job already started. *InterSub-5* is working on the Total Frigg pipelines and will go to Elf in July for an unspecified period. Trials on the TROV remotely controlled unmanned submersible have not yet been completed due to pressure of commitments on the vessles, but it is planned to deploy the unit from *InterSub-5*.

Robot rescue Meantime, Sonarmarine has relocated its *SMT-1* TROV vehicle which was working on the Ninian field when its umbilical cable parted. Newer sister unit *SMT-2* is now being used to carry out the recovery operation having completed work for Amoco and Sonarmarine's other unit the TREC, which has also joined in the search, has been returned to base for modifications.

))) **Scorpio Unmanned Submersible Inspects Tunnels of Huge Dam.** Intake and overflow tunnels as much as 67 meters below the surface of the Fort Peck Dam in Montana were given a maintenance inspection by the unmanned submersible Ametek Straza *Scorpio* in a 14 day project. Operated by Oceaneering International, the sub carried closed circuit television cameras and video recorders. The longest tunnel was 789 meters long. In other operations *Scorpio* can carry CTFM sonar and a manipulator arm. The dam is the largest earth filled dam in the world.

))) **Lloyd's Register Lists Submersibles, Diving Systems.** Lloyd's Offshore Register for 1978-1979, off the press recently, lists Submersibles, Diving Systems and Mobile Drilling Rigs classed or certified by Lloyd's Register. It lists owners' names, addresses, telephone and Telex numbers. The work units include ships, barges and platforms used in offshore installation, inspection and maintenance work. Write to Lloyd's, Manor Royal, Crawley, West Sussex RH10 2QN, England.

FOR SALE
SUBMERSIBLE "SEARAY"
SRD101

2-man, 1500 feet operating depth, 20 foot length, 5 foot beam, 8930 pounds dry weight. Submersible being retrofitted. As is $65,000.00. Subsea Air Systems, 3816 Cheasty Blvd. So., Seattle, WA. 98108, (206) 722-4546.

Submersible for Sale

Uniquely-designed/built, privately-owned submarine ideal for film-work and/or underwater observation. Stored dry and under cover. Design specs: 600' operating depth; 5-10 knots, 100 hrs. endurance, 48 hr life-support submerged; 2 crew; 4 observers. Flood lights; 180° forward/slide ports; bottom port. Transportable by rail, road and sea. Price: $525,000 commissioned/tested, F.O.B. Miami. Inquiries: J.M. Booth, 189 Townsend, Suite 205, Birmingham, MI. 48011. Telephone: (313) 642-1382.

Are They Really Stairs To Atlantis?

New York Times News Service

MOSCOW — Plato, Sir Arthur Conan Doyle and all science fiction writers who have puzzled over the riddle of the lost continent of Atlantis, move over for Professor Andrei Arkadyevich Aksyonov.

Soviet scientists may maintain that the Bermuda Triangle is nothing but water and that flying saucers are optical illusions, but Aksyonov says he has photographic evidence of a man-made stone wall and staircase at a depth of 200 feet in the Atlantic Ocean, about 275 miles southwest of the Portuguese coast.

Perhaps.

"It's possible that it's part of Atlantis — maybe not the whole thing, but a part," said Aksyonov, a man of established scientific reputation, a deputy director of the Institute of Oceanology of the prestigious Soviet Academy of Sciences.

His evidence, he concedes, is limited: two pictures, showing 11 stones that he believes bear the mark of human hands.

The photographs were taken two years ago, not by Aksyonov but by a colleague, Vladimir I. Marakuyev, with a submersible camera on the underwater summit of the Ampere Seamount, a dormant seabed volcano about midway between Lisbon and the Madeira archipelago. The ocean floor around the seamount is more than 10,000 feet below the surface.

In his office at the institute, Aksyonov said he was sorry but he could not show the pictures. "They belong to Marakuyev, and he is very sick with a heart condition in a hospital," he said. "I think they'll be published in one of our scientific journals sometime soon."

Marakuyev apparently did not realize what he had until late last year, when he got around to developing film from a 1977 exploration of the seamount made in the Soviet research vessel Moskovsky Universitet. "I don't know why it took him so long to get to them," Aksyonov said.

He will not say he has discovered Atlantis, but he readily offers directions to anybody else who wants to.

"All you would have to do is take a ship with the right equipment to the Ampere Seamount, go down 60 meters, find the stones and bring them up to see if they are man-made or not," he said. "It's my personal opinion that they are."

Accounts of the discovery were published in Europe earlier this spring, and Aksyonov says they brought amused smiles from oceanography colleagues in Denmark.

"I asked them, 'Did any of you believe this?' They said no, and they said they laughed a lot."

As he describes the eight pictures, only two are really interesting.

"One of them shows eight stones — four square ones and four rounded ones, in a line about 3½ or 4 feet long," he said. "Specialists who've looked at it say it's a typical wall from antiquity.

"The second photo shows three equally spaced stones at the left-hand edge, and it appears to be part of a staircase.

"Heinrich Schliemann, the great 19th century German archeologist, found the ruins of Troy in Turkey by studying the poetry of Homer very attentively," he said. Schliemann, too, got a skeptical reception at first.

Atlantis was described by Plato in two of his dialogues, the "Timaeus" and the "Critias."

"Plato says that it was located in the Atlantic Ocean and on an island, and that the tribes living on it took part in wars in southern Europe and in North Africa before one day the island sank between walls of water," Aksyonov said. "I believe that the objects in the pictures once stood on the surface too, though specialists say it's difficult to believe.

"The seamount could have sunk so far." he said. "But if I were younger, I'd lead an expedition to investigate further myself."

He says a catastrophic earthquake in Lisbon in 1755 caused a tidal wave and flood that left part of the capital forever beneath the sea. Something similar, he surmises, may have happened to an island of which the Ampere Seamount is the submerged remnant.

The legends around Atlantis have been nourished over the centuries. It has been variously located in America, Scandinavia, the Middle East and the Canary Islands, 500 miles south of the Ampere Seamount.

"The ocean is full of mysteries," Aksyonov said, "and our investigations are the beginning of our understanding."

Ex-Spy Vessel's Use In Oil Hunt Proposed

ATLANTA (AP) — Discovery of a potentially oil-rich barrier reef off the U.S. coast has prompted federal officials to consider using the former spy ship Glomar Explorer for deepwater explorations in the Atlantic, a federal official says..

The director of the U.S. Geological Survey, H. William Menard, who participated with President Carter in an energy symposium Thursday at Georgia Tech, said the ship could be refitted to conduct the oil explorations.

Menard said an extensive re-evaluation has shown that the reef of the Reforma and Campeche continental shelf off the Mexican coast, which has provided Mexico's oil and gas reserves for years, does not stop in the Gulf of Mexico.

The reef, which could contain up to six billion barrels of oil, apparently "is almost continuous from Maine to Florida," Menard said.

He said its presence was not discovered until recently because it lies under 6,000 feet of water and is buried under at least 6,000 feet of sediment on the ocean floor. He said the reef runs about 120 miles off the Atlantic seaboard in a vein 15 miles wide and about 20,000 feet thick.

Menard said the agency is seriously considering reactivating and refitting the Glomar Explorer, built for the Central Intelligence Agency by the late Howard Hughes' Summa Corp., to conduct explorations in the region during the next two years.

The refitting would cost $60 million to $70 million, but the USGS is negotiating with representatives of some oil companies on a cost-sharing project, he said.

The Glomar Explorer, built at a cost of $550 million, has been in mothballs for two years. It was last used in the Pacific Ocean to recover part of a sunken Russian submarine in 17,000 feet of water 750 miles northwest of Hawaii.

erry Announces Large Subsea Vehicle Project

Perry Oceanographics, Riviera Beach, Fla., has launched one of the largest single construction projects in subsea vehicle production—the building of a 3000-FSW submarine, a manipulator maneuvering bell, and a handling system contracted for Saipem S.P.A. of Milan, Italy.

Bruce C. Gilman, Perry president, announced receipt of the order. Saipem, as a division of the ENI Group, is a leading international contractor for the oil industry worldwide in the field of land and offshore drilling, pipelines, sealines, and industrial plants construction.

The contract calls for construction of a three-man submersible of the PC-16 class equipped with updated sonar, instrumentation and operating gear for subsea work; a 3000-FSW, two-man atmospheric bell with twin Perry six-function manipulators and a Perry "grabber" arm; and a bell handling system. Perry will also provide engineering modifications to an existing handling system for the submarine. The project delivery date is in February 1980.

The Saipem submarine will be designated PC-1602. PC-1601, operated by Intersub for Northern Offshore Limited, has successfully performed a number of missions for Saipem in previous years. Saipem officials said the new equipment will perform innovative tasks supporting Castoro Sei laying the deepest pipe ever offshore.

Perry And Newman Named At Perry Oceanographics

Henry A. (Hap) Perry has assumed presidency of Perry Oceanographics of Riviera Beach, Fla. Mr. Perry, the son of founder **John H. Perry Jr.**, has been associated with the Perry Companies for many years, principally in the newspaper, cable, and TV operations, and has been president of Perry's Cable Communications Corporation for several years.

Mr. **Perry** named **Jon P. Newman** as acting marketing manager for the company. Mr. **Newman** has been associated with Perry Oceanographics for 12 years, and was senior staff engineer prior to becoming marketing manager.

Perry Oceanographics is one of the world's largest producers of commercial submersibles and associated undersea equipment. The company also provides engineering services, ocean services, and fabrication services for a wide variety of customers throughout the world.

San Diego-Based Firm Sells Vehicle For Undersea Work

ESSO Australia Ltd. is taking immediate delivery of the first production remote-controlled vehicle made by San Diego-based Hydro Products Inc. It will be used in undersea work for bottom search, surveys and construction operations.

The vehicle, sold for $800,000, can work at depths to about 2,000 feet.

Japan And Saudi Arabia In Joint Diving And Engineering Venture

It has been announced in Tokyo that a new company, BINMECO (ABAHSAIN-IHI-NC Marine Engineering Co., Ltd.) was established in the city of Alkhobar in Saudi Arabia recently, with the object of undertaking various diving and underwater engineering work. It is a joint venture between Saudi Arabia's leading construction company ABAHSAIN (Salen & Abdulaziz Abahsain Co., Inc., headquartered in the city of Alkhobar; president, **Abdulaziz Abahsain**); Japan's leading heavy industrial manufacturer and shipbuilder IHI (Ishikawajima-Harima Heavy Industries Co., Ltd.), and Nihon Civil Diving Co., Ltd., a Japanese marine engineering firm. This is the first joint venture of this kind to be established in Saudi Arabia by Japanese companies.

ABAHSAIN is a leading construction company whose main activity is the installation of on-land pipelines. Nihon Civil Diving Co. is engaged in diving and underwater engineering work, including installation, repair and maintenance of submarine oil pipelines. It is also conducting a comprehensive survey on the exploitation of ocean and fishing resources.

Perry Awarded Contracts For Sub Components

Perry Oceanographics, Inc., Riviera Beach, Fla., has been awarded contracts for a special manipulator system, large hemispherical window, and internal and external manways and hatches for the construction of a new MSM-1 Italian Navy Rescue Submarine by Breda Shipyard, Venice, Italy.

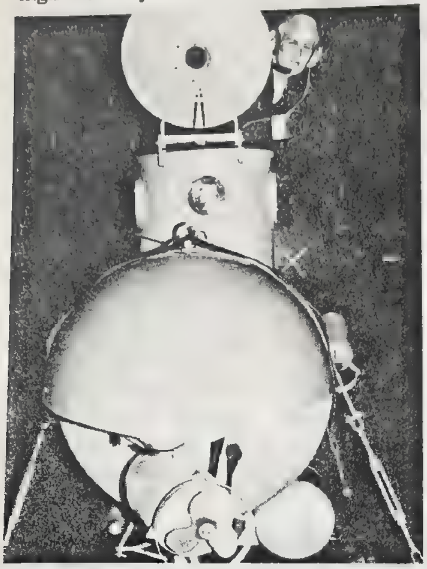
The seven-function manipulator system is a new design featuring smooth proportional rate control by a joystick held in the operator's hand. It is capable of lifting 110 pounds, and has a 350-pound gripping force.

Lockheed May Encapsulate Subsea Production Systems

Lockheed Petroleum Services, Vancouver, British Columbia, may enter a joint venture soon with Norway's A. S. Bergen Mekaniske Verksteder to develop encapsulated subsea production systems and related services for use offshore Norway. Lockheed has developed a one-atmosphere encapsulated system for the subsea production of oil and gas and is currently commissioning a nine-well subsea system off Brazil.

The One-Man Yellow Submarine

Capt. George W. Kittredge USN (Ret.) '40 has built, since 1968, 30 one-man submarines for commercial and experimental use, 12 feet long and capable of 250' depths. All have been painted a bright yellow; not for the Beatles but for high visibility underwater.



George Kittredge and his yellow submarine

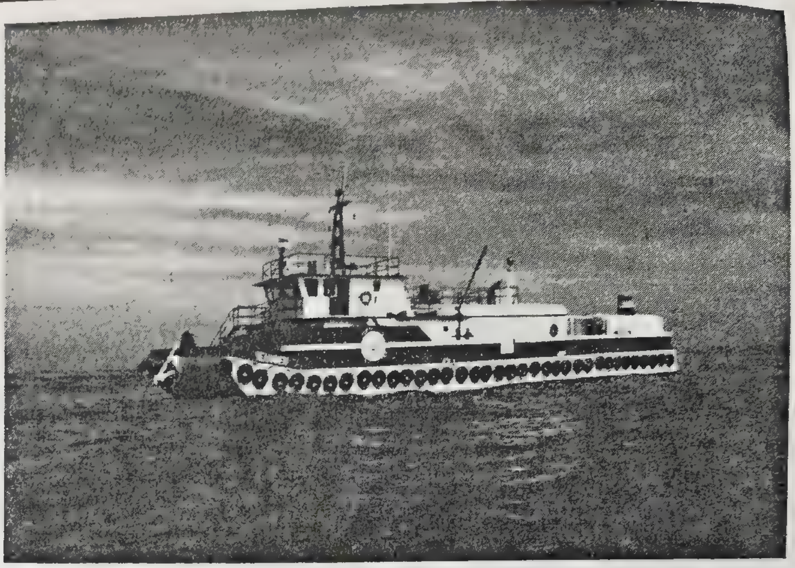
Recently Capt. Kittredge brought his new K-600 submarine to Annapolis for testing by the David Taylor Naval Ship Research and Development Center Laboratory's deep ocean pressure tank. The 14-foot model was first tested, unmanned, to 900 feet, then, with Kittredge on board, to a simulated depth of 600 feet.

This 4,500-pound sub was developed for A.S. Sub Service Ltd., of Oslo, Norway, to serve various purposes. It can be used to conduct undersea exploration, inspection and salvage operations; to operate as a launch and recovery vehicle; and to enable an underwater engineer to carry out his work in a safe, one atmosphere environment.

Oceaneering's ARMS Bell II Completes First Dives in U.K.

Oceaneering International, Santa Barbara, Calif., reports its ARMS Bell II has completed four dives to a depth of 166 m. The bell's operators supported the drilling trials off the drillship *Pacnorse* in Scottish waters outside the Firth of Clyde. The one-atmosphere bell, rated to 914 m, was used in one dive to recover bottom samples for survey purposes and was certified by Lloyd's Det norske Veritas during the operation. During the summer months the ARMS Bell II will support the drilling activity of the *Pacnorse* which will be under contract to Amoco for one well off the northwest coast of Ireland.

Submersible Support Vessel Instrumentation Development



Normal submersible launch/recovery operations from Nekton's support vessel *Seahaven* (which features an elevator built into the stern) require no swimmers or divers.

The 30-m submersible support vessel *Seahaven*, launched earlier this year by Nekton, Inc., San Diego, has passed sea trials and is currently working on tests of an experimental tool for measuring voltage potential on pipelines. Planned from the keel up as a support ship for the 2130-kg *Nekton* submersibles, *Seahaven* is operating out of Morgan City, La.

With a 13-m beam, the vessel features high stability and a mechanically powered elevator built into the stern for submersible launch and retrieval. The elevator becomes part of the work area when in the up position. In the down position it is submerged about three m.

Normal launch and recovery operations require no swimmers or divers, and no lines are attached. During docking, the submersible is piloted into position with the aid of a floating target that indexes the sub over a teflon-cushioned nesting cradle on the elevator. The elevator lifts the sub at 0.6 m/sec to deck level, where it can be transported on a track to an airconditioned hangar/workshop.

The *Seahaven* has accommodations for seven crew and five other personnel. Built at the V.A.P. Marine Shipyard, Amelia, La., the vessel is powered by two Murray-Tregurtha outdrives powered by Detroit Diesel 671 for a speed of 6.5 knots. Cruising range is 2500 miles with a 15-day endurance.

alapagos Rift Expedition To Employ CCD Television System

Almost three thousand m deep at the Galapagos Rift spreading center, colonies of clams, mussels and other animals live in small "oases" near several hot water vents. These "backwards ecosystems", apparently not dependent even indirectly on photosynthesis, astonished researchers on a 1977 geology/geophysics/geochemistry expedition.

Last month researchers from several institutions began another multidisciplinary cruise to the site, about 200 miles northeast of the Galapagos Islands. On one leg, biologists will examine the hot vents for the first time.

Researchers will work from the University of Miami's R/V *James M. Gilliss* and the Woods Hole Oceanographic Institution's (WHOI) submersible *Alvin* and tender *Lulu*. The ANGUS towed camera system will also be employed. Sponsored primarily by the National Science Foundation and the Office of Naval Research, the expedition will receive additional funding from the National Geographic Society.

Biologists hypothesize that the hot vent food chain depends on hydrogen in water emerging from the vents. According to the theory, bacteria metabolize the chemical into organic material, providing the food source for the rest of the chain.

However, physiological adaptations required for such a food chain would presumably take thousands of years, and the vents are estimated to last only about a hundred years. This seems to indicate that many vents exist, but the five Galapagos vents are the only known in the world. Postulating a magma cell near the vents, some expect to find another group close by.

As on the first expedition, *Alvin* will provide most samples. This time the sub will carry a slurp gun (to sample organisms including an elusive, previously unknown "dandelion") and a new second arm that will hold an experimental color TV camera.

Based on charged coupled devices (CCD) developed by RCA Electro-Optics and Devices, Lancaster, Pa., the camera is encased in a standard 10-cm diameter Benthos housing. The great depth prototype system took a cooperative effort by RCA, National Geographic, WHOI and Benthos.

The CCDs, which act as electronic imagers, are among the most complicated silicon devices ever built. The camera is built around three CCDs (one for each primary color).

Each CCD has a surface, measuring 13mm on the diagonal, which contains 512 by 320 picture elements and is divided into two parts. The top half receives light images and the bottom half acts as a very short term memory.

Impulses generated by the picture elements ("pixels") move down into a register every sixtieth of a second, giving signals from which TV pictures can be recreated.

CCD advantages over conventional TV system components include high stability, lack of lag, freedom from pattern burn and greater precision. (Some developers feel that in time the devices will replace conventional TV and photographic film.)

The main advantages for working at great depths, however, are the greatly decreased space, weight and power requirements.

On *Alvin* the camera will mount on the second arm along with two lights. Five other lights on the sub should allow images with excellent color and texture. With a new battery system, filming can last up to 5 ½ hours, about as long as *Alvin* will stay down.

A Canon 12mm-75mm macrozoom lens will cover from 5 cm (allowing closeups to fill a screen) to infinity. Images will be recorded on ¾" and high-band 1" magnetic tape. The entire system has successfully passed tests to over 2,000 m in the Bahamas.

New Rules Published On Life Preservers

The July 2 Federal Register contained new regulations governing requirements for lights and retroreflective material on life preservers and other lifesaving equipment.

The rules require vessels engaged in ocean, coastwise, or Great Lakes service—except ferries and small passenger vessels—to have approved personal flotation device lights (PFD lights) on life preservers carried onboard. Vessels in all services, including vessels in lakes, bays, sounds or river service must have approved retroreflective material on life preservers.

The regulations become effective August 1. However, compliance with the new requirements is postponed until after June 30, 1980, for purposes of allowing time for the approved PFD lights and retroreflective material to become fully available to vessel owners.

Although the rules are final, the Coast Guard is allowing interested parties to submit written comments to the Commandant (G-CMC/81) (CGD 76-28), U.S. Coast Guard, Washington, D.C. 20590, to insure that the rules as revised represent workable and reasonable requirements and procedures.

U.S., France to Continue Ocean Research Programs

Ten joint United States-France projects in oceanographic research will be augmented by others in the next 18 months, scientists from both countries agreed after a scheduled conference held in Washington in May. New areas to be included in the cooperative program include ocean thermal energy conversion (OTEC) and bio-conversion.

Work will continue in diving by submersibles (the French *Cyana* and *Archimede* and the U.S. *Alvin*), diving medicine and habitat missions. Of special interest to U.S. diving scientists is the French doppler bubble detector which spots decompression bubbles in the blood streams of divers by acoustic means. Other diving studies will include research on breathing processes at great depths and aseptic bone necrosis. French scientists will participate in saturation missions in NOAA's NULS-1 habitat off St. Croix, U.S. Virgin Islands.

Underwater Propulsions,Inc.-5409 S. 101 E. Ave.-Tulsa Oklahoma-74145 who produce a wet submersible called the Diver Delivery Vehicle (DDV).Capable of 300' depth and about 15'(?) long it was at the OTC

a local (Bristol, PA) TV station had a news feature on test dives of a new mini-sub, the DEEP HOPE. Hope Industries, a tank manufacturer, built it and is planning to market them.

An interesting letter has been received from M. Claude Caillart, who heads the group operating the French CYANA.

CYANA has completed her tests after the winter refitting. They have made an unmanned dive down to 2450 meters.

The sub has recovered a lost, and valuable, prototype transponder. And there are two scientific operations scheduled for the summer: In Biscay Bay, based in the French harbor Bayonne; and In the Aegean Sea, based in the Greek harbor Herakleion (Crete).

Received a letter from the British Aerospace stating in part, 'at a board meeting in September....it was decided that we would not continue with the development and manufacture of submersible vehicles-CONSUB 2. I would say we had reached the stage whereby we sold the complete CONSUB 2 system to Sub Sea Surveys Limited,Old Bank Chambers, 127 Duke St.,Barrow-In-Furness, Cumbria LA14 1XA, ENGLAND,who continue to use this system successfully....'

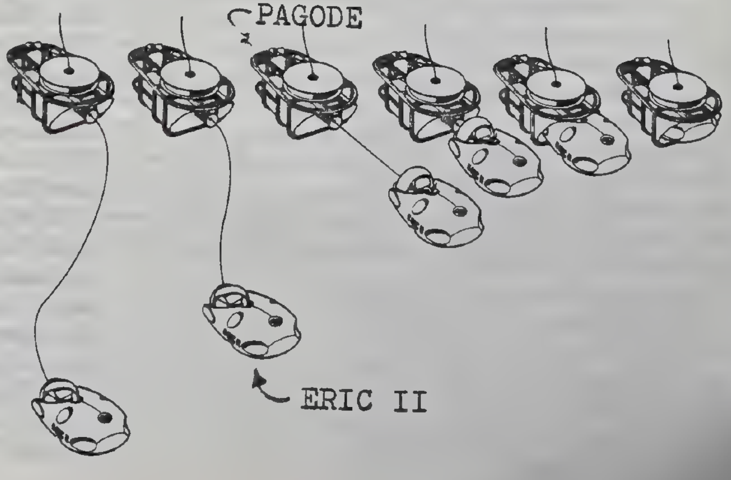
A few more last minute "buzzes" about HYCO...PISCES VI has been sold to I.U.C. AQUARIUS I has been sold to Can Dive Oceaneering. HUDSON HANDLER has been sold to an unknown in Louisanna. And there is talk that one of the original HYCO founders is starting over again. Rumors are that one of the first sales will be 2 deep subs for Russia - 20,000'.

Birgit Arkenstedt (Sven Rahmberg's secretary) writes that the URF is presently at Kockums Shipyard where additional work is being done. Sea Trials will resume at the end of Aug. Then the URF will be transported to her base, the Naval Diving Centre, in the vicinity of Stockholm.

Wharton Williams,Ltd.(Mr.R.Wharton-Farburn Estate-Dyce-Aberdeen, England) has a 2000' rated one-man diving vehicle (like WASP) made of glass reenforced plastic.

Mantis 2&3 used successfully offshore England-Mantis 4 nearing completion-Wasp 2&3 working in Brazil-Mantis 5&6 to be produced in August (envelopes never received to document any of these vessels)

The ERIC 10 and the ERIC II/ PAGODE system(Direction Technique des Constructions Navales-2,Rue Royale-Boite Postale No.1-75200 Paris Naval-FRANCE)are shown to the right.The ERIC 10 can go to 1600'and I think the ERIC II to 300m. The PAGODE is an unusual cable delivery system.



ivil War Ironclad Vessel Largely Intact

From The San Diego Union's News Services

OFF CAPE HATTERAS, N.C. — The wreck of the Civil War ironclad warship Monitor suddenly appears in the murky depths of the Atlantic 16 miles southeast of Cape Hatteras like a massive barge emerging from a thick fog.

From a small porthole on one side of a little four-man research submarine, the Union ship that revolutionized naval ship design appears broken, but largely intact.

This is despite the battering it took when it sank in 210 feet of water while under tow in a winter storm on Dec. 31, 1862.

The sinking came after the Monitor engaged the Merrimack — another armored Union ship, which had been seized by the Confederates and renamed the Virginia — in the historic Civil War battle of the ironclads on March 9, 1862 off Hampton Roads, Va.

Clearly distinguishing the Monitor from hundreds of other wrecks in this area known as the Graveyard of the Atlantic is the 21-foot-diameter turret that once rotated on a bronze ring to aim its two guns at the enemy.

The Monitor rests upside down on the sandy, shell-littered bottom. The turret broke off its perch on the iron deck and slid toward the stern. An aft section now rests on the turret, suspended several feet above the sea bottom.

Patrolling the wreck are schools of fish — mainly amberjack — and a large grouper that divers call Sam.

The fish are attracted to the wreck by abundant marine life affixed to the iron plates that distinguished the Monitor from all other ships in the Union fleet.

Several observation missions are planned by two aluminum submarines exploring the Monitor in a program sponsored by the National Oceanic and Atmospheric Association, the Harbor Branch Foundation of Fort Pierce, Fla. and the state of North Carolina.

The remains of the Monitor, 172 feet long and 41 feet wide, were discovered in 1973 by scientists from Duke University. It was photographed extensively in 1977.

This month, divers working from the two submersibles and the mother ships, the Sea Diver and Johnson, are excavating a 5-foot section believed to lead to the officers' quarters and the captain's stateroom.

Divers expect to find weapons, pieces of clothing and other artifacts, and possibly will come across the remains of some of the 16 men lost when the Monitor sank.

More than 30 divers, scientists and technicians are taking part in the slow, detailed investigation. NOAA Administrator Richard Frank has called it "the most important underwater archeological event of this century."

The Monitor rests on a portion of the ocean bottom that, from the observation sub cruising a few feet above the sea floor, appears like a desert, with water replacing air and broken shells replacing stones.

The ship's bottom plates, originally three-eighths of an inch thick, are caved in at some spots and completely gone in others, with only encrusted iron beams remaining. A section of plate ripped from the ship lies to one side.

If the Monitor can be brought to the surface, archeologists, engineers, historians and the American public will have a national treasure to study and admire.

Expedition officials feel the technology is available to recover the ship, but they say several years of evaluation lie ahead before any decision can be made.

"Preservation of the Monitor is the first consideration, and leaving it where it is might turn out to be the best way to do that," said Floyd Childress of the NOAA.

"I hope not," he added.

"It's a wreck that's been on the sea floor for 117 years, and it's suffered as a result of that," Childress said. "Basically, it's stable now. The deterioration is slow when compared to the corrosion and structural damage that occurred when it first sank.

"Once you move it or part of it, you change its environment severely," he said. "You change the salinity, the temperature, the pressures and the organic matter — all of which could hasten deterioration."

For that reason, he said, each artifact recovered will be put through a preservation process to prevent further decay.

"As for raising the Monitor, we've received a number of proposals," Childress said. "We probably do have the technology to recover and stabilize it. But we can't say when and how or whether it will be done or how much it will cost.

"It probably will take another five years of study by the best minds we can gather," he said. "In the end we'll come to a scientifically based conclusion.

"That's really what we're seeking here," Childress added. "NOAA's role is to see that it's done correctly and that whatever is recovered is for the American people. We all have a stake in this."

NOAA manages the 6-mile-diameter circle around the Monitor that has been designated a national historic site and a marine sanctuary.

Suggestions for raising the ancient ironclad have included cutting it apart and bringing it up in sections; using the former CIA ship, the Glomar Explorer, to pick it up in one piece; freezing a chunk of water and mud around it to allow it to float to the surface, where it could be towed to shore, and hoisting it in the more traditional way with slings and pontoons.

If the superstructure cannot be retrieved, Childress said there is a possibility the revolving turret with its two powerful cannons might be lifted.

Childress cautioned that even if the technology is found to lift the vessel, the money might not be there to do the job.

He said Monitor buffs are hoping that museum displays of artifacts found on this expedition will inspire either government or private backing for additional exploration and perhaps for a recovery effort.

International Symposium on Marine Salvage

NEW YORK HILTON HOTEL
OCTOBER 1, 2, 3, 1979

MARINE TECHNOLOGY SOCIETY
(SPONSOR)

THE MARITIME ASSOCIATION OF THE PORT OF NEW YORK
(SPONSOR)

THE FIRST DAY – Monday, 1 October 1979:

Opening Remarks – The Chairman, Captain W. F. Searle, Jr.,
Chairman, MTS Professional Committee on Salvage & Diving.

Keynote Address – Hon. C. P. Srivastava,
Secretary General, International Maritime Consultive Organization (IMCO)

Morning Session: "Parties To Salvage-I"
Chairman: George Emmerson,
Principal Surveyor, (N.A.) The Salvage Association of London.
"Salvage – The Vessel Owner's Point of View"
Speaker: To be announced.
"Salvage – Cargo Interest's Point of View"
Speaker: James J. Donovan, Esq., Donovan, Maloof, Walsh & Kennedy & President, Maritime Law Association.

Luncheon:
Address by The President – Mr. A. Wilbraham
President, International Salvage Union & Chairman,
United Towing Co. Ltd.

Afternoon Session: "Parties to Salvage – II"
Chairman: Mr. John L. Sullivan,
President, Smit International (Americas) Inc.
"Salvage – The Hull Underwriters Point of View"
Speaker: Mr. Raymond Hicks, Manager of Claims,
American Hull Insurance Syndicate.
"Environmental Pollution – The Third Dimension of Salvage"
Speaker: Captain A. F. Dickson, Director, Shell International Marine (London) & Chairman, Oil Companies International Marine Forum.
"Salvage – The P&I Interest's Point of View"
Speaker: George B. Freehill, Esq., Freehill, Hogan & Mahar.
"The Attorney's Role in Salvage"
Speaker: Kenneth H. Volk, Esq., Burlingham, Underwood & Lord.

THE SECOND DAY – Tuesday, 2 October 1979

Morning Session:
"Contracts & Compensation For Salvage"
Chairman: Richard Jaeschke, President, U.S. Salvage Association.
"Salvage Contracts"
Speaker: Gordon Paulsen, Esq., Haight, Gardner, Poor & Havens.
"Lloyd's Arbitration Procedures As They Relate To Salvage"
Speaker: J. G. R. Griggs, Esq., Consultant, Ince. & Co.
"American Salvage Awards Committee"
Speaker: William Marks, Vice President, Talbot Bird & Co. Inc., & Chairman, The American Salvage Awards Committee.

Luncheon:
Address by Mr. L. J. Buglass, Consultant & Author on Marine Insurance:
"Salvage & The Marine Insurance Industry"

Afternoon Session:
"Salvage Posture – The Sovereign's View"
Chairman: Edward C. Kalaidjian, Esq., Thacher, Proffitt & Wood.
Presentations will be made by representatives of six of the world's maritime nations.

Dinner –
Address by Judge Charles S. Haight, U.S. District Court, Southern District, New York.
"Salvage As Viewed From The U.S. Bench"

THE THIRD DAY – Wednesday, 3 October 1979

Morning Session: "Salvage Operations & Technology"
Chairman: T. A. Fain, President, American Institute of Marine Underwriters.
"Fundamental Considerations In Rescue Towing"
Speakers: Mr. Stuart Lawrie, Exxon Corporation; Mr. John Butt, Shell Oil Co.; Captain L., Westdijk, Smit International.
"State of the Art of Offloading Cargo From Stricken Vessels"
Speaker: Captain Nan Halfweeg, Bureau Wijsmuller.
"The Gaming Approach to Contingency Planning for Salvage"
Speaker: John E. Flipse, Texas A&M University and Chairman, National Research Council Panel on Response to Casualties Involving Ship-Borne Cargoes.
"Peril At Sea & Salvage – A Guide For Masters"
Speaker: Captain Hugh Spicer, Manager/Foreign Fleet & Terminal Coordination – Mobil Shipping & Transportation Company.

Luncheon:
Address By Pieter Kleyn van Willigen,
President, Smit Internationale, N.V.
"Salvage as a Dynamic/Evolutionary/Advancing Concept: Where Do We Go From Here?"

Closing Remarks & Symposium Termination

OFFICIAL CARRIER – PAN AM WORLD AIRWAYS
International Attendees are invited to contact local Pan Am offices for travel assistance

REGISTRATION COUPON

INTERNATIONAL SYMPOSIUM ON MARINE SALVAGE
NEW YORK HILTON HOTEL – OCTOBER 1, 2, 3, 1979

(Please print or type)

We wish to make Symposium Registration(s) for _____ Delegates. Our Check for $_________, covering each registration at $395.00 is attached, made payable to INTERNATIONAL SYMPOSIUM ON MARINE SALVAGE.

IMPORTANT: To assure reduced rate registration your check for $395.00 per delegate must accompany this form, which must be received not later than August 31, 1979. Later registrations will cost $450.00 each.

NAME: ______________________ TITLE: __________
NAME: ______________________ TITLE: __________
COMPANY/ORGANIZATION: ______________________
ADDRESS: ______________________
CITY __________ STATE __________ COUNTRY: __________
TELEPHONE: __________ TELEX: __________

(If additional registrations to be made, attach separate sheet to this form)

For the guidance of the Program Committee, please check here if you have made reservations directly with The New York Hilton Hotel .... ☐

Send this with your check, to:
International Symposium on Marine Salvage, 34th Floor
80 Broad Street, New York, N.Y. 10004.

HOTEL ACCOMODATIONS

NEW YORK HILTON HOTEL 1335 Avenue of the Americas New York, N.Y. 10019 212/586-7000

Please circle desired accomodations below:

NAME ______________________
(please print)
ADDRESS ______________________
CITY __________ STATE __________ COUNTRY: __________

SINGLE: $52, $58, $64, $70, $76 DOUBLE/TWIN: $68, $74, $80, $86, $92
EXECUTIVE TOWER: Single: $79 Double/Twin: $95 SUITES: Parlor & One Bedroom: $155, $165, $175, $185
Parlor & Two Bedrooms: $210, $220, $230, $240

Additional person in room: $16 No charge for children occupying same room as parents. (Maximum 4 persons)

Family plan for 5 or more: 2 rooms each charged at single rate.

Reservations must be received not later than three weeks prior to opening date of Symposium and will be held only until 6 PM on day of arrival unless later hour is specified. If room requested not available, nearest room will be provided.

DATE ARRIVING: __________ HOUR: __________ AM/PM
DEPARTURE DATE: __________ HOUR: __________ AM/PM

Room charges subject to 8% Sales Tax and New York City Occupancy Tax.

DETACH THIS COUPON AND SEND DIRECTLY TO NEW YORK HILTON HOTEL.

NAME ______________________

ADDRESS ______________________

CITY, STATE, ZIP ______________________

AFFILIATION ______________________

MARINE TECHNOLOGY 79
NEW ORLEANS, LA•HYATT REGENCY

MEMBER MTS ☐
NON-MEMBER ☐
PARTICIPATING ORG. ______________________

☐ SESSION CHAIRMAN ☐ SPEAKER ☐ EXHIBITOR ☐ SPOUSE TO ATTEND ____________ NAME

CIRCLE APPROPRIATE AMOUNT

ADVANCE REGISTRATION •		REGULAR	REGULAR WITH PROCEEDINGS	REGULAR PLUS SPECIAL MEALS	REGULAR WITH PROCEEDINGS & MEALS
MTS & PARTICIPATING SOCIETIES		$45.00	$60.00	$80.00	$100.00
NON-MEMBERS		55.00	70.00	90.00	110.00
STUDENTS	3 DAYS	20.00	35.00	55.00	75.00
	1 DAY	10.00	25.00	45.00	65.00
ONE DAY ATTENDANCE		20.00	35.00	55.00	75.00
				TOTAL ALL BOXES CIRCLED	

*Registration at Conference $10.00 additional

MARINE TECHNOLOGY 79 PROCEEDINGS	MEMBER	NON-MEMBER	MAILING	TOTAL
	$30.00	$35.00	$4.00	

MTS MEMBERSHIP	$25.00	

MAKE CHECKS FOR REGISTRATION TO:
MARINE TECHNOLOGY 79

MAIL TO:
MARINE TECHNOLOGY SOCIETY
HEADQUARTERS SUITE 412
1730 M STREET N.W.
WASHINGTON, D.C. 20036

MAKE ALL HOTEL RESERVATIONS DIRECTLY WITH HYATT REGENCY FILL OUT THIS CONVENIENT FORM AND MAIL (PREPAID) FOR ACCOMMODATIONS

HYATT REGENCY NEW ORLEANS

NAME ______________________
FIRM ______________________
STREET ADDRESS ______________________
CITY ____________ STATE ______ ZIP ______
WILL ARRIVE ____________ (Date) WILL DEPART ____________ (Date)
MY COMPANY WILL ☐ WILL NOT ☐ GUARANTEE PAYMENT
CHECK IN TIME 3 P.M. CHECK OUT TIME 12 NOON

CIRCLE RATE DESIRED

IF ROOM IS NOT AVAILABLE AT RATE REQUESTED, RESERVATIONS WILL BE MADE AT NEAREST AVAILABLE RATE.

SCHEDULE OF RATES

SINGLE OCCUPANCY (ONE PERSON)		NO. OF ROOMS	NO. OF PERSONS
STANDARD	$48.00		
MEDIUM	$53.00		
DELUXE	$58.00		
DOUBLE OCCUPANCY (TWO PERSONS) ★			
STANDARD	$58.00		
MEDIUM	$63.00		
DELUXE	$68.00		
SUITES			
1 BEDROOM - SMALL	$125.00		
1 BEDROOM - LARGE	$190.00		
2 BEDROOMS	$250.00		

Additional person in room
Children under 12 free when sharing room with adults.
NAME(S) OF ADDITIONAL PERSON(S) SHARING ROOM ______________________

★ PLEASE SPECIFY
☐ 1 BED
☐ 2 BEDS

NOTE: Reservations will be held until 6:00 P.M. unless accompanied by deposit or company guarantee. Reservations MUST be received 30 days prior to opening date of convention.

- 238

MARINE TECHNOLOGY 79
MARINE TECHNOLOGY SOCIETY
OCTOBER 10-11-12-, 1979

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

JANUARY, 1980

Vol. XIV, No. 1 Published by the Deep Submersible Pilots Ass'n

The DSPA was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to:

Robert K. R. Worthington or	Donald E. Saner
Editor & President, DSPA	Secretary, DSPA
3005 Curie Street	4707 Berwick Drive
San Diego, CA 92122	San Diego, CA 92101
(714) 453-1158	(714) 278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman, DSPA
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

Congratulations to Capitaine de Corvette Plancon on his assignment to command of the Deep Submersibles Group of the French Navy.

I received from Joe Vadus, Manager of Ocean Technology of the NOAA Office of Ocean Engineering, a copy of their "technology assessment", Remotely Operated Vehicles, prepared by Frank Busby Associates. Those interested in obtaining a copy may do so from the Sup't of Documents, Government Printing Office, Washington, D.C. 20402. Sorry, I don't know the price.

The DSPA Annual Meeting was held during OCAINS '79 at San Diego, CA on 18 September, 1979. The attendance was small, but the meeting was useful. Please read the Secretary's report of the meeting and advise me of your thoughts regarding the various subjects discussed.

OCEANS '80 will be held at Seattle 8-10 September, 1980, and will be sponsored by the IEEE Seattle Section and the Council on Oceanic Engineering. If DSPA Member attendance warrants, Vancouver-Victoria Members will be requested to organize a DSPA meeting.

Welcome on board to Ron Rau, our first new member of 1980! Ron is at the Lockheed Ocean Lab in San Diego. He was a test pilot on the DSRV project.

SECRETARY'S REPORTS AND NOTICES

DSPA Annual Dues--Yes, it's that time again. Dues are still $10.00 for North American addresses, $15.00 for overseas addresses. Please provide corrections to addresses and indicate whether you prefer NEWSLETTERS, etc. to be mailed to home or business address when you mail your check. The following Members remain in arrears for 1979 and have been dropped from the rolls. Anyone in contact with them, please advise them they may be reinstated on request along with payment of dues for 1979 and 1980 plus $10.00 fine.

Matt Fisher   Michael McQuown   John O'Donnell   Bruce Martin

Dues may be paid to any DSPA officer, preferably to the Treasurer, Jerry Shiller.

DSPA Annual Meeting--at MTS/IEEE "OCEANS '79", San Diego, CA 9/18/79

Met in Town and Country Convention Center at 1730.

Members Present	Non-Members Present
Bob Worthington	Ed Briggs-SWRI
Merle Wilson	John Reiter-ABS
John Donnelly	Ken Privitt-MARFAB
Larry Megow	
Jerry Shiller	
Will Forman	
Doug Privitt	
Don Keach	
Larry Shumaker	

Bob Worthington-President of DSPA:

1. Requested suggestions for DSPA programs and activities improvements.
2. Described "European branch" of DSPA, I.U.P.A., organized by Alan Whitfield. Repeated Whitfield's request for attendees and speakers at their "Operational Safety of Manned Submersibles" symposium in London on 2/12/80.
3. Discussed the need for prompt payment of dues, notification of address changes and employment, reports to NEWSLETTER, etc.
4. Requested comments on suggestion for Constitutional amendment to extend terms of office to two years.
5. How to increase DSPA prestige and influence?

Larry Shumaker-

1. Recommended formalizing DSPA/IUPA relationship.
2. Increase involvement of DSPA in MTS committee matters, particularly where safety is involved.
3. Perhaps we should revive our effort to obtain Corporate Members.

Jack Bennett-

1. Recommended that we avoid getting involved with corporate management personnel membership .

Larry Megow-

1. Offered to write an article for trade magazines re DSPA and this meeting for publicity purposes.

ABS vs. Doug Privitt/NEKTON "single-wire grounded electrical system controversy. A lengthy discussion occurred, stimulated by

the most welcome presence of John Reiter, the cognizant ABS representative. Privitt described the difficulty of negotiating with ABS; they ignore the validity of his specific arguments and respond in generalities. Shumaker recommended that DSPA determine the merits of the case and take a definite stand, pro of con. Reiter stated that the 1968 MTS Guidelines were reviewed at the Submersible Safety Seminar in London last year and the recommendation against grounded electrical systems was supported. The ABS committee of "operators" and industry members concurred. ABS would be liable to legal suit if they now approved such systems and injury or loss resulted from a failure of such a system. ABS would be willing to review the matter again if additional information is made available. Privitt did not think the ABS committee possessed the necessary expertise and, besides, the committee had not been shown Privitt's evidence that the single-wire system is safe for low voltages, possibly safer than a two-wire system.
A motion was made and seconded that a committee be formed to report on recommendations for DSPA's stand on the controversy. Will Forman was appointed Chairman of the committee with the task of selecting members as appropriate.

Larry Megow presented those present with his own works of art, to wit, rattlesnake vertebrae earrings for their spouses.

The meeting was adjourned at 1830, and Larry Megow hosted at dinner all those able to attend.

DSPA San Diego Luncheon Meetings

10/18/79---Met at 1145 at Tarentino's.

Members Present	Non-Members Present
Bob Worthington	John Shiltz
Don Saner	Mel Wills-TRANSQUEST
Will Forman	Al Smith-DEEP QUEST
Doug Privitt	
Don Rosencrantz	
Jerry Shiller	

Don Saner reported that DEEP QUEST would be working on the filming of "Raise The TITANIC" in late November.

Will Forman reported on his investigation of the ABS vs. grounded electrical systems in deep submersibles. He had been able to obtain little information from the San Diego ABS office library where he could not, despite John Reiter's assurance, discover a copy of the new ABS Rules for Building and Classing Underwater Systems and Vehicles. He asked Privitt to provide him with a complete file of his correspondence on the subject.

Jerry Shiller reported on NEKTON operations. One boat is presently performing a popeline inspection off Santa Barbary using a newly devised (by NEKTON, Inc.) pipeline fault detector.

11/16/79---Met at 1145 at Tarentino's.

Members Present
Bob Worthington
Jerry Shiller
Doug Privitt
Don Saner
Jack Bennett
Will Forman
Merle Wilson

Non-Members Present
Paul Bienhoff-DSRV MYSTIC
Pat O'Brien- " "
LCdr Dick Hall-DSRV AVALON
Tim McClay- " "
Mel Willa- TRANSQUEST
Al Smith-DEEP QUEST
Craig DeWeese-MARFAB
Ken Privitt- "

Bob Worthington passed around a copy of "Remotely Operated Vehicles" received from Joe Vadus, Office of Ocean Engineering, NOAA.

Jack Bennett gave a rundown on the submersibles session at the MTS Symposium on Ocean Energy in New Orleans 10-12 October. His assessment was that the session was neither interesting nor productive.

Don Saner reported that DEEP QUEST will participate this month in five days of filming unedrwater scenes for the movie "Raise the TITANIC". The NUMA submersible's name will be changed to DEEP QUEST in the movie.

Dick Hall, Skipper of AVALON, described the "fly-away" practice rescue operation in which AVALON was flown to the U.K. and mated with an R.N. nuclear sub, HMS REPULSE, from which a realistic rescue operation of the crew of an R.N. diesel sub, HMS CAIN, was performed.

Next luncheon will be mid-January at the Mexican Village in Coronado and will be followed by a tour of the DSRV Submarine Repair Unit at NAS North Island. No luncheon is planned for December.

REPORTS FROM MEMBERS

Ross Saxon (10/01/79)
"For your information, Bob Starr has left Martech and is now down in Mexico with the Vasquez brothers at Diavaz. Other than being extremely busy trying to build Nautilus Engineering into a position its capabilities are worthy of, I've not much to report. One of these days time will permit a San Diego visit to coincide with a DSPA meeting- that I will look forward to."

Jean-Marc Plancon (11/13/79)
"After one year as C.O. of an oceanic minesweeper, I am back in the deep submersible world, I,m now Commanding Officer of the Deep Submersible Group of the French Navy. On my Group depend:

1. The world-renowned bathyscaphe ARCHIMEDE, alas! always waiting for a sponsor to continue her research.
2. GRIFFON, a 2,000-foot observation submersible which can be operated from the Underwater Operations Ship TRITON or from a pier equipped with a 15-metric ton crane.
3. The unmanned vehicule ERIC I which can now operate to 1,500 ft.
4. LICORNE, a new 1,000-foot lockout sub which the Navy dockyards are finishing for us.

5. PARC ERIC II: the Navy and CERTSM are building this RCV (20,000 feet/6,000 meters) which is an integrated deep underwater system for exploration, systematic search and intervention, remotely operated from a surface ship.

6. Other vehicles and tools for underwater research and recovery.

As you see, it's a complete fan of underwater operations, a pleasant but arduous job.

By the way, I belong to an Interministerial Group, working to get new French legislation on civilian submersibles, including factory acts and labor laws. We're trying to get an original way to avoid the burden of the "French Merchant Marine Act", too constraining but definite enough to protect the European deep submersible pilots by means of license and collective wage agreements. Can you help me with that job and send me all American laws, agreements, and rules on the subject.

It's really a pity thet San Diego is so far from here, but maybe I will try to come to consult Sub DevGroup One next year, a good occasion to establish tighter ties.

May everybody in DSPA know that it would be regrettable if any member should come to the south of France without a call in Toulon."

Alan Whitfield (12/01/79)

"Enclosed is the October IUPA Newsletter. Sorry for the delay in posting it to you. I have joined the Mantis Project and a company called H.M.B. Subwork. The submersibles are 2,000 ft. rated, one-man, one atmosphere. Recently, we have been involved with the recovery of the Tornado fighter aircraft in the Irish Sea, the search for a wreck in the Arctic off Norway, and inspection work (N.D.T. and photography) on the Thistle "A" Platform in the North Sea.

(Ed. note: Cover page of IUPA Newsletter follows.)

International Underwater Pilots Association DEEP SUBMERSIBLE SECTION.

Secretary:- A. Whitfield,
12 Frankton Ave.,
Haywards Heath,
West Sussex. TEL - 0444-892066.

OCTOBER I979.

"SCANNINGS".

I.Some books you may wish to obtain:-
  a)Lloyds Register of Submersibles & Diving Systems. I978/I979 . (£I2).
  b)Jane's "fighting" Submersibles.I979/I980. (£32).
  c)Submersibles & their use in Oceanography,& Ocean engineering.R.A.Geyer. (£25).

2.During the summer, Pisces VI was taken over by IUC,and has been working from the Discoverer Seven Seas off Newfoundland.

3.Seabug has been on trials off Stonehaven.(J.Wilits,A.Lamont.)

4.The last time I spoke with Oceaneering,the following were on the Arms bells.
  a)Arms I. - Off Columbia.
  b)Arms II.- Off Ireland.
  c)Arms III. Off the Artic Circle.(J.Purcell,K.Parker, L.Levity,F.S.P.,H.Kulman.)

5.Trov (Sonarmarine) was recently trapped at the bottom of Thistle "A". Infabco divers locked out at 500ft to do the recovery.

6.The 2W Omas/Spider has been put into mothballs,apparantly.

7.Leo is now in the Med.,doing a tanker survey for SSOS.

8.Wasp 00I. is in Hawaii taking U/W films.Wasp 002 is offshore Brazil. Wasp 003. has completed a refit,after returning from Spain.

9.Mantis 002 & 003. were diving in the Artic Circle last month, (P.Sheader & R.Barr.)

I0.Mantis 004. has been doing the NDT inspection programme on Thistle "A".(Myself,J.Jones,L.Sandry,R.Connor,M.Howath.)

II.A.Meads tells me that Boctopus operations are to be terminated, and that the vehicle is to be sold.

I2.Finally my apologises for the delay in this publication. Merry Christmas.

ED.

UNDERWATER
SERVICES
INC.

December 20, 1979

DSPA
Mr. Robert Worthington
Editor & President
3115 Curie St.
San Diego, CA 92122

Dear Mr. Worthington

Underwater Services, Inc. was recently formed and two of our principals are changing their positions and capabilities which you may be aware of.

Steven H. Johnson is the President of Underwater Services, Inc. He is now actively involved in the marketing and promotion of our new company. He is also President of VePa Ventures, a Canadian underwater consulting company. Mr. Johnson has done a wide range of work worldwide with numerous vehicle systems, both manned and remote operated.

Robert J. Starr is the Chairman of the Board for Underwater Services, Inc. He is presently Vice-President of Diavaz in Mexico. There he is in charge of all diving operations. He has worked with numerous vehicles in the offshore industry, including manned and unmanned systems.

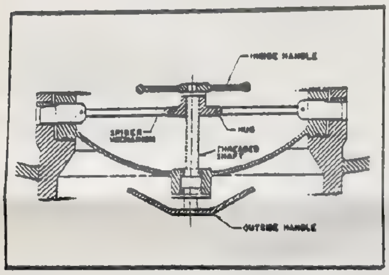
Underwater Services, Inc. was formed to help existing companies deal not only with the operational problems encountered with unmanned systems, but to meet the increased demands in manpower during peaks in a fluctuating environment of supply and demand. We are able to offer both personnel and complete systems on short or long term arragnements as the need arises.

Underwater Services, Inc.'s personnel have ten years experience in vehicle operations worldwide. We have had key personnel involved in most of the work when new vehicle applications were introduced.

2205 HAYES ROAD #5504 • HOUSTON, TEXAS 77077 • (713) 974-0680

Dry Transfer Hatch Patent Won by Perry

Perry Oceanographics, Inc., Riviera Beach, Fla., has been awarded Patent no. 4,121,383 for an improved dry transfer hatch for use on undersea vehicles. The hatch is designed to open toward the inside instead of the outside, and therefore a large external dry transfer spacer skirt is unnecessary. Other features include tighter two-way sealing strength and elimination of protruding hubs, handles, and shafts which traditionally have presented hazards in undersea vehicles.



As shown in the cutaway drawing, the handle on the inside of the hatch is nearly flush with the wall of the vessel. When the door is opened, the threaded shaft moves the hub of the spider mechanism toward the concave inside surface of the door, pulling the locking members inward. The leverage is greater than conventional designs, allowing tighter closure with less effort, and easier opening.

An improved design for the outside handle also allows it to be recessed substantially within the opening. Additionally, the shape of the outside handle makes it much less susceptible to fouling lines or snagging on objects.

The new hatch design has been incorporated into the two diver lockout modules for the Perry PC-15 Class submarines.

Submarine Safety System Developed By ERNO

The ERNO organization of Bremen, Germany, has developed a system long sought by submarine builders to rescue leaking/unmaneuverable submarines incapable of resurfacing due to water leakage into the diving cells. Developed after 3 years of research, the "Resus" submarine safety system consists of 1.5-meter-long (about 5-foot) hydrazine-filled cylinders able to create large masses of gas within seconds. The gas fully displaces water in the diving cells, causing the vessel to surface. For example, from an 84-meter depth (about 276 feet), a submarine can rise to the surface in a matter of 26 seconds. The German Federal Navy is currently equipping 24 U-boats with the Resus emergency "blow-up" system. Several other countries have contacted ERNO regarding the Resus system. For more information, contact ERNO, D-2800 Bremen, POB 105909, Germany. (Telephone 0421/5394 349, Telex 0245 548)

Japanese Spherical Submersible Capable of Research at 200 m

A Japanese-made compact, highly maneuverable, spherical, manned craft for use in exploration and research of sea bottom and capable of operating at depths to 200 meters recently passed trial tests. It was built by Nippon Kokan (NKK).

The craft, named *Tankai*, has a diameter of about 3 meters and a height and breadth of 2.92 meters. Weighing 5.7 disp. tons (submerged), the craft has a transparent, double-wall, acrylic resin lower hull (1.5 meters inside dia.) which affords a 360 degree horizontal and downward scope of vision for the two-man crew of operator and observer. NKK reports that the craft is suited for use in research and exploration of ocean resources, inspection of offshore structures and submarine pipelines and for conducting salvage surveys.

ABS Publishes Rules Fo Building And Classing Underwater Vehicles

The American Bureau of Shipping (ABS) has published the first edition of Rules for Building and Classing Underwater Systems and Vehicles. These Rules, in association with the latest edition (1979) of the ABS Rules for Building and Classing Steel Vessels, present the requirements and procedures for the classification of underwater systems.

The Rules for Building and Classing Underwater Systems and Vehicles replaces the Guide for Classification of Manned Submersibles, which was published by ABS in 1968. Over the past 11 years, ABS has gained extensive experience with more than 200 diving bells, submersibles, wellhead cellars and manifold centers. It also has gained the approval of the Norwegian Petroleum Directorate (NPD) as a certification agency under the NPD provisional regulations for diving on the Norwegian continental shelf.

In the publication, underwater systems are defined as submersibles, personnel capsules, diving bells, diving systems, and habitats. The classification of diving systems includes the diving bell and other components, such as umbilical lines, gas control equipment, gas storage facilities, deck decompression chambers, or launch and recovery systems. As an alternative, a diving bell may be individually classed and other components individually certified in accordance with provisions given in appendices to these Rules.

The publication covers materials, fabrication, life support systems, mechanical equipment, electrical installations, acrylic viewports, design, and surveys after construction, and includes an index. It was developed with the guidance of the ABS Special Committee on Underwater Systems and Vehicles, which is composed of individuals eminent in the underwater industry.

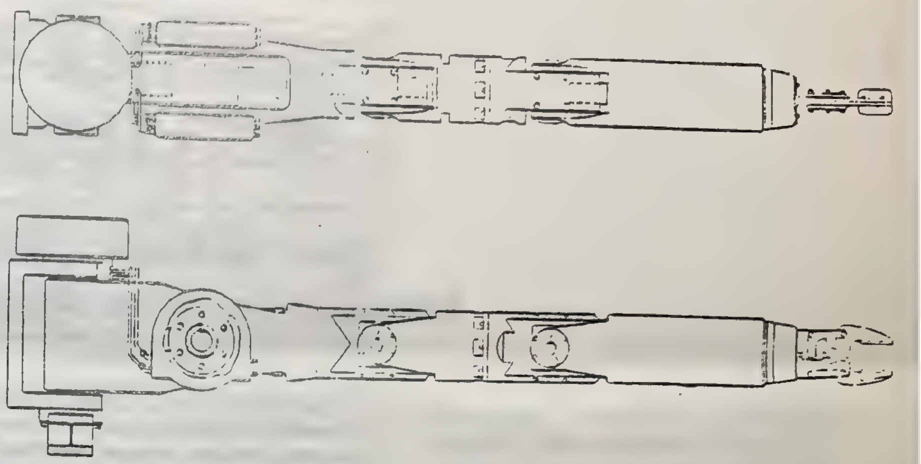
The Rules sells for $15 in the USA. Copies can be ordered from the Book Order Department, American Bureau of Shipping, 65 Broadway, New York, N.Y. 10006, or from a local ABS U.S. or overseas office. Shipping costs will be added to overseas orders. Sales tax should be added where required.

Italian Rescue Sub To Use Perry Manipulators

A Perry advanced manipulator system is under construction for installation on the Italian Navy's new MSM-1 rescue submarine. The underwater work package, slated for September delivery, includes two of Perry's new seven-function manipulators, a hydraulic power package, a tool package, a portable consolette, an inboard control panel, and other items including motor starter and electrohydraulic function boxes.

Perry was awarded the contract for the system by Cantiere Navale Breda, Venice. The Italian shipyard firm also ordered a set of Perry manways, hatches, and a large hemispherical window for the submarine project.

The 600-metre-rated manipulator system uses servo valves in series with counterbalance valves for smooth proportional rate control. Each tool and arm has a solenoid-actuated on/off valve to isolate the component from the system. The arms feature mechanical forearm-wrist joints with a presettable flange adjustment for lift or swing configuration.



The sketch above shows two views of Perry's new seven-function manipulator, featuring smooth proportional rate control, increased swing in all joints, and a wrist extension capability. The manipulator has a 350-lb. gripping force and is capable of lifting 110 lb.

---

2 die in bid to rescue 2 in diving bell

London (Reuter) — Two Frenchmen are trapped in a diving bell on the ocean bed off Ghana and two men have died trying to rescue them, an oil company spokesman said last night.

The spokesman for Phillips Petroleum said the two men had been trapped since Saturday morning when the cable connecting their diving bell to a ship snapped.

He said there had been no contact with the divers, whom he declined to identify, and he did not know their chances of survival.

A French diver and a medical assistant from the Ivory Coast died early yesterday in a decompression chamber following a rescue attempt, the Phillips spokesman said.

The diver had tried to reach the men, stranded 425 feet under water, he said.

The divers are employed by the French firm Comex, contracted by Phillips Petroleum to carry out undersea work in the area.

The spokesman said the bell's cable snapped Saturday as the two men were being hauled to the surface about 20 miles off the Ghana coast.

They had been mending a mechanical fault in an exploratory oil well.

The spokesman added that a full rescue operation had been launched and special diving suits had been flown from Britain.

A Comex official in Britain said the French divers had sufficient supplies of oxygen and helium for several days. But the men would be suffering from cold and could have been injured when the bell plunged to the bottom of the ocean.

He said rescuers wearing special armor-plated diving suits known as "jim-suits" were attempting to put a metal sling around the 1-ton bell and winch it to the surface.

Fatal diving bell recovered off Ghana

LONDON (UPI) — A diving bell in which two French oil-rig workers were trapped and died has been recovered off the coast of Ghana, a Phillips Petroleum Co. spokesman said Monday. The men were cut lose Saturday morning 450 feet below the surface of the Atlantic when the bell plunged to the sea bed during oil exploration work as a hoisting cable came away. Earlier, a French back-up diver and a Ghanaian doctor died as they tried to reach the workers and the stranded bell. The bell was recovered Sunday night, the spokesman said.

Manned Submersibles Still Hold Upper Hand

But Technology Improvements Make Unmanned Subs Attractive Economically

by Larry L. Booda
Editor

In the worldwide tug-of-war for dominance in undersea work systems between manned and unmanned submersibles whose services are applied mainly to the offshore oil and gas industry, the manned versions still hold the upper hand. But technology improvements being incorporated in the robots are making them more attractive. More and more the key economic element distinguishing the two kinds of systems is the cost of life support.

In this updating review of the status of manned submersibles some significant changes must be noted since *Sea Technology* published the exhaustive "An Overview of Submersible Activities Worldwide in 1977," by R. Frank Busby, which appeared in the January, 1978, issue, page 15. That presentation is recommended as the background information bank for our readers.

Despite a slowdown in the manned vehicle field since 1976 when the count of subs was 91, ranging in status from operational to under construction, the count as of mid-October was 97, with eight under construction, two in refit and eight inactive, according to Busby.

Manufacturing Base Limited

From the standpoint of other industries, manufacturing of manned subs is extremely limited in its scope. There is only one producer of appreciable size in the United States, Perry Submarine Builders. Earlier this year Perry changed its directions somewhat and underwent a change in management. A company spokesman said that employment is slightly higher than it was two years ago.

Over the years Perry has built 29 manned submersibles certified by the American Bureau of Shipping. This number includes a maneuvering diving bell. Included in other production are 50 diving systems, 60 deck chambers, 11 unmanned vehicles, 32 observation bells and 10 one-atmosphere dry transfer vehicles.

Also in the production pipeline was the Mobile Diving Unit (MDU). Under contract to Seaforth Maritime Ltd., Aberdeen, Scotland, Perry constructed this major component of a 16-man semisubmersible diving complex. The overall complex contractor was Occidental Petroleum (Caledonia) Ltd. The whole system was scheduled for delivery this year.

The Perry MDU, based on both diver lockout submarine and conventional diving chamber technology, will give the divers horizontal mobility, nearly unlimited electrical and hydraulic power at the work site and a full at-site surface monitored instrumentation capability. It weighs 18 tons and can operate to a depth of 305 meters. It consists of a one-atmosphere observation chamber (AOC) and a three man submersible decompression chamber (SDC).

Mounted above the SDC, the AOC permits an excellent view through a 79 cm panoramic window. It contains controls, navigation, sonar and communications systems. It also acts as the operating station for a manipulator and hydraulic tool package. A hatch connects the two chambers.

The MDU also has television, welding, waterjet and nondestructive testing capabilities and is designed for dry transfer to welding habitats.

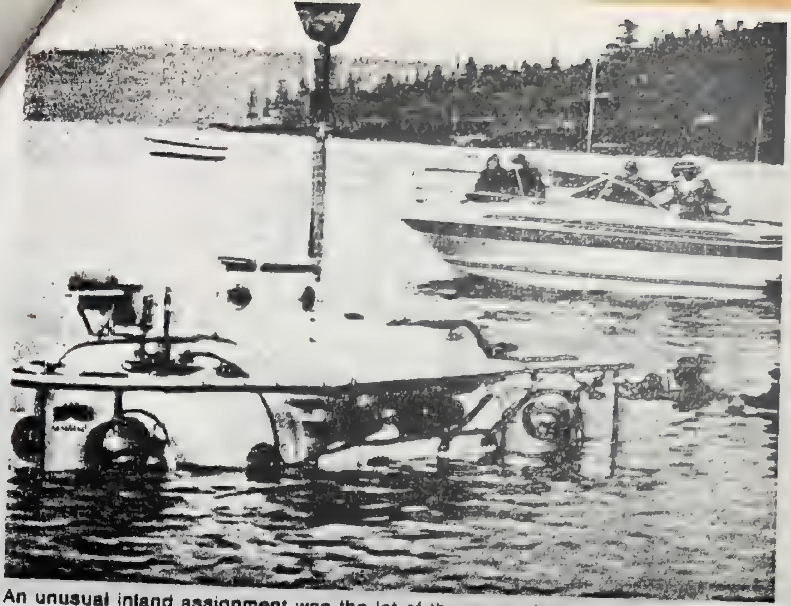
Perry's most recent delivery was the 915 meter depth, three-man PC-1602 for Saipem of Italy. It and a two man diving bell will be used aboard the huge pipelay vessel *Castoro Sei.* (See *ST* for July, page 10.)

Sub Manufacturers Outside U.S.

In Canada there was an upheaval in June when HYCO—International Hydrodynamics Ltd.—ceased operations in Vancouver, B.C. The reason given was the precipitous drop in demand for manned submersibles in the offshore oil and gas fields. HYCO built 15 subs in its 10-year production run.

HYCO was known for its *Pisces* series of submersibles. Last spring the *Pisces IV* was certified by the American Bureau of Shipping to operate down to 2,000 meters (6,560 feet). What was believed to be the company's last delivery was the *Pisces VI* to International Underwater Contractors.

HYCO's technology, plant and equipment were sold to a newly formed company, Canadian Underwater Vehicles (CUV), headed by Mack Thomson, former HYCO employee. The company began operations August 1. With 15 former HYCO employees, it landed a contract for $19.5 million to



An unusual inland assignment was the lot of the manned submersible *Pioneer I* recently. Here the three man vehicle is shown being deployed in Lake Tahoe, Nevada-California, to perform studies of the geological, biological and ecological effects of present day exploitation of the shoreline and the lake itself. Martech International, the operator, performed the dive. The dives were sponsored by the San Jose, Cal., Mercury News and the scientists were from the University of California at Davis, headed by Dr. Charles R. Goldman.

Diving in Fresh Water

Beginning Oct. 15 the manned submersible *Pioneer I*, built by Martech International of Houston, made a series of dives in Lake Tahoe, a large fresh water lake shared by Nevada and California, with the former holding the greater share.

The dives, ostensibly for research by the University of California at Davis, was sponsored by a newspaper of the Ridder chain, the San Jose *Mercury News*. However, the scientific surveys of the lake, sediments, biology etc., got lost in a media blitz. Dives were made to the bottom of a canyon 305 meters deep.

The water was very cold. Difficulties were encountered launching from a beach. A motor crane was used for that. Retrieval was accomplished by towing it with a backhoe.

Weather slowed the dives, but some 16 were made. . . .*Pioneer I's* next assignment will probably be in Brazil for fisheries research. . . .Martech has had Remotely Operated Vehicles in Brazil for 2½ years.

build for the Soviet Union a manned sub and three remote controlled vehicles.

There was one exception to the transfer, however. It is the *Taurus*, a six person lock-out, lock-in sophisticated submersible now on lease in Scotland to General Oceanics, Ltd. Design rights belong to the Canadian government. CUV may be able to obtain rights and work with Vancouver Shipyards in building two for India.

In England Vickers, the major submersible manufacturer there, was taken over by the government when it got into economic trouble. However, this "nationalization" has assumed an unusual character in that a U.S. company, Brown and Root-Halliburton, bought into it and is a partner.

Here is the Vickers picture. Vickers Oceanics and Vickers Slingsby were taken over by the National Enterprise Board. A partner was Wharton Williams enterprise, British-owned, to form a British-dominated firm dedicated to the underwater engineering field. But a foreign interest is held by Brown & Root UK, a subsidiary of the giant Halliburton Group.

The new company is as known as British Underwater Engineering (BUE). Ric Wharton is chairman, while former B&W UK man David Sadler is Managing Director. The national board holds 89% of BUE, B&R 10% and Wharton Williams 1%. The two minority holders will increase their shares to 24.5% at some unspecified point in the future.

The deal involves BUE acquiring the Vickers Oceanics fleet of nine submersibles and five support vessels plus all of the plant and equipment of Vickers Slingsby.

Other British manufacturers are the Osel Group, producers of the WASP one-man, one-atmosphere diving suit and the MANTIS submersible and UMEL (Underwater Marine EquipmentLtd.), manufacturers of the JIM one man, one atmosphere diving suit series.

In France Comex is the outstanding submersible producer. Early this year Comex launched the SM 358 after being in construction for 12 months. It passed its trials in the Bay of Marseille. It is 7 meters long and has a speed of three knots and can perform observation missions to a depth of 300 meters. Its endurance is eight hours. Special tools can be used with its manipulator arm.

The SM 358 can conduct dry transfer operations to a habitat, carrying three persons at one atmosphere for the mission. It has diver lock-out, lock-in capabilities from the diver chamber with saturation diving to 200 meters. Normally the forward compartment carries the pilot and divemaster while three divers operate from the aft compartment.

Another Comex product is the SM 360. It can perform the same tasks as the SM 358. It has greater speed, however, and can range farther over the eight-hour operating period. Both are being delivered to a state-owned petroleum company. Comex built one submersible for the Peoples Republic of China.

The French Navy has contracted to have a lock-out, lock-in submersible, called the *La Licorne*, built for delivery next year.

The West German submersible manufacturer Bruker-Physik built a lock-out, lock-in submersible named the *Mermaid V*. It was sold to an undisclosed eastern European country.

Perhaps the biggest submersible project outside the U.S. is underway in Italy. Cantiere Navale Breda of Venice is building a rescue submersible for the Italian Navy. It is called the *MS-M-1*. It will feature two of Perry's seven-function manipulators, a hydraulic power package, tool package, portable consolette, inboard control panel and other items including a motor starter and electrohydraulic function boxes. Breda also ordered Perry manways, hatches and a large hemispherical window.

A new European firm in the submersible business is A/S Møllerodden of Norway. The company calls its sub an "aquacopter." Carrying two persons it will be able to dive to 300 meters. Named "CheckMate," it is powered through an umbilical. Construction is of clear acrylic to permit wide visibility for the crew. Respiratory gases for 120 hours are carried.

Underneath the CheckMate's pilot compartment is a service section containing a multi-function manipulator which is operated from the pilot chamber. It features pressure feedback, and is aimed at the offshore industry.

Variant Vehicles

So-called "JIM" suits are variously called one-man submersibles, one-atmosphere diving suits, and some unprintable names. JIMs have articulated arms and legs. They were developed by Underwater Marine Equipment, Ltd., in coordination with Oceaneering International. A smaller JIM fabricated with aluminum is called SAM. A slightly different vehicle, the WASP, has thrusters instead of legs, while MANTIS has no arms.

Operating Costs

When it comes to operating costs manned submersibles can vary tremendously in charges per day. It all depends on what work is to be performed. For instance a lockout submersible with its support vessel in the North Sea can cost $20,000 to $25,000 per day. The *Mermaid II* of International Underwater Contractors is available with its ship for $6,000 to $7,000 per day.

A one-atmosphere sub such as the *Nekton* operating in the Gulf of Mexico is less than $2,500 per day; with a ship, $5,000 per day.

JIM suits for 30 days or less run $4,000 to $6,000 per day; over 30 days, $1,500 to $3,000. ☐

— Staff Photo by Peter Koeleman

Special effects man Neil Smith works on a replica of a submarine that will be a stand-in for the Deep Quest during filming of a movie.

FILM SET BEING BUILT

Part Of 'The Titanic' Will Be Raised Here

Did the Titanic really sink off Point Loma on that spring night in 1912 instead of in the North Atlantic as history records?

Regardless of where it sank, efforts will be made in December and January to "Raise The Titanic!" off San Diego.

A submarine and other equipment are being built on San Diego's waterfront right now that will be used to float the vessel that claimed 1,513 lives when it struck an iceberg.

"Raise The Titanic!" is not a disaster movie but a $20 million film on raising the ship with huge magnets.

The submarine that is being built just south of the Tenth Avenue Marine Terminal will be a stand-in for Lockheed Ocean Laboratory's research submersible Deep Quest.

The sub being built is actually a steel mockup and will not be manned during the filming, said a spokesman for Marble Arch-International Television Corp. which is making the movie.

Jason Robards, Richard Jordan and David Selby will star in the picture that is being filmed in Alaska, Washington, D.C., Los Angeles and San Diego.

Filming started this week in Washington and from there the crews will go to Alaska and are scheduled to arrive in San Diego just before Thanksgiving.

Some scenes will be shot aboard an aircraft carrier here and most of the underwater filming in the ocean will be off Point Loma.

The movie is scheduled for completion in late January and plans now are for release early next summer.

William Frye is the producer, Jerry Jameson is the director and John DeCuir is art director.

Tiny Research Sub Takes a Dive in Lake Tahoe

TAHOE CITY (AP)—A tiny submarine silently glided into icy Lake Tahoe Monday for test dives before carrying its three-man crew into the eerie depths for the first exploration of one of the world's highest, deepest lakes.

The 17-foot-long submarine, dubbed Pioneer I, will explore, photograph and use a mechanical arm to pick up objects during a four-day, around-the-clock probe with an estimated cost of more than $30,000.

The sub entered the lake at 8:45 a.m. and began its test runs about an hour later. After testing, a barge began a two-hour tow to take the sub to the location of its first dive.

During the first three-hour exploration dive, project head Dr. Charles Goldman of the University of California at Davis, pilot Don Bolstad and reporter Ken Castle of the San Jose Mercury News, which is sponsoring the project, were to examine an underwater landslide just east of here which is thought to have shifted a large section of the lake wall.

Goldman said he expected about 50 hours of diving, noting that for each eight hours under water, eight more hours were needed to recharge the sub's batteries.

The lake that Mark Twain called "the fairest picture the whole world affords" is estimated to be 1,645 feet deep, third deepest in North America. At 6,225 feet above sea level it is the highest of its size in North America and holds enough water to cover California to a depth of 14½ inches.

It is known to be a graveyard for dozens of ships and planes. It is also believed to hide human bodies which never surfaced because the water, which gets as cold as 39 degrees, prevents bloating and decomposition.

The scientific team, headed by Goldman, will be seeking new data on the biological, ecological and geological past and future of the lake.

Submariner Reports Big Lake Tahoe Trout

TAHOE CITY (UPI) — At least one underwater section of Lake Tahoe looks like a grassy pasture and is teeming with enormous lake trout, the leader of a submarine exploration said yesterday.

"The lake looks very healthy," said Dr. Charles R. Goldman, a UC Davis scientist and leader of the first submarine venture into the deep waters of the high Sierra lake.

On the second day of exploring the lake in a 17-foot-long submarine, Goldman dived more than 200 feet in one of the shallower areas of the lake, offshore from casino-choked Stateline, Nev.

"Down there it looked as if you were in a pasture," Goldman said, adding that light penetrated the water, even 200 feet below the surface.

Goldman reported seeing many huge mackinaw trout, a lake species that often grow to 15 pounds. They were introduced into Tahoe in 1894.

Goldman said the sub descended to the bottom at 210 feet, described as "an underwater hill," and sighted some "near record" trout. He did not estimate the weight.

He said earlier he expected to find trout in the 40-plus pound range down to 600-foot levels.

Scientists believe the Mackinaw is capable of survival at depths to 600 feet and growth to at least that size.

Minisub Works Free From Ledge Deep In Mountaintop Lake Tahoe

TAHOE CITY, Calif. (AP) — The 12,000-pound minisub Pioneer I, carrying a crew of three on the first deep exploration of Lake Tahoe, became stuck far below the surface Tuesday but freed itself quickly and continued its mission of discovery.

The incident occurred while the sub was making a two-hour, 210-foot dive on the spawning grounds of the Mackinaw trout, about 2 miles off the South Lake Tahoe shore on the California side.

Members of the crew said the 17-foot-long sub, whose cigar shape is supported within a framework of thick piping adorned with powerful lights, cameras and tanks, was exploring beneath a ledge. It got stuck when it tried to move up but was able to free itself horizontally.

The sub was manned by Charles P. Goldman, a lake expert with the University of California; P. Anthony Ridder, president and publisher of the San Jose Mercury News which is financing the exploration; and an unidentified pilot.

Setbacks Force Scientific Team to End Sub Dives in Lake Tahoe

TAHOE CITY (AP)—University of California lake expert Charles R. Goldman says the Lake Tahoe underwater expeditions, beset by bad weather and equipment failures, have been called off.

Goldman said he reluctantly declined an offer by the owners of the submarine Pioneer I to continue the dives into the mile-high, alpine lake. He says most of the UC Davis research crew has left the area.

Despite the mishaps and the bad weather, Goldman said the dives had turned up new information about animal and plant life in the mysterious lake, one of the world's highest and deepest.

Remotely Operated Vehicles Continue Rapid Growth Offshore

by Eric Bender
Associate Editor

Everyone who works offshore coins a different name for Remotely Operated Vehicles (ROVs), also known as "unmanned" submersibles. By whatever name, they play an increasing role in offshore petroleum operations and other work ranging from torpedo recovery to scientific survey.

With minimal danger to human life, ROVs often perform certain tasks (primarily inspection and monitoring) more cheaply than divers or manned submersibles. Specialized ROVs offer unique capabilities, such as *in situ* repair of seafloor telephone cables (by AMETEK Straza's SCARAB). A Navy tethered ROV operates to six km depths, the current operational limit of manned submersibles.

An untethered ROV built for manganese nodule surveys also works at those depths. With advances in power supplies, data processing, communications, manipulators and other areas, untethered ROVs will eventually participate in many kinds of ocean operations.

Worldwide, the rapidly evolving ROV fleet numbers about 156, according to a study made this year by R. Frank Busby Associates, Arlington, Va. (Performed for the National Oceanic and Atmospheric Administration's Office of Ocean Engineering, the report, *Remotely Operated Vehicles*, is available from the Government Printing Office, Washington, DC 20402, stock number 003-017-00465-1. *Sea Technology* here draws heavily on the report.)

Of these 156 ROVs, 112 are tethered freeswimming, 17 are bottom crawling, 17 are towed and 10 are untethered. (This does not count more than 120 PAP-104 mine neutralization vehicles built by Societe ECA, Meudon, France.)

Five years ago this total was only 20 ROVs, mostly working intermittently on military and scientific tasks. Offshore oil and gas operations have generated an explosive growth and now support about 90% of ROV operations. Tethered free-swimming commercial systems, and some promising research, are discussed below.

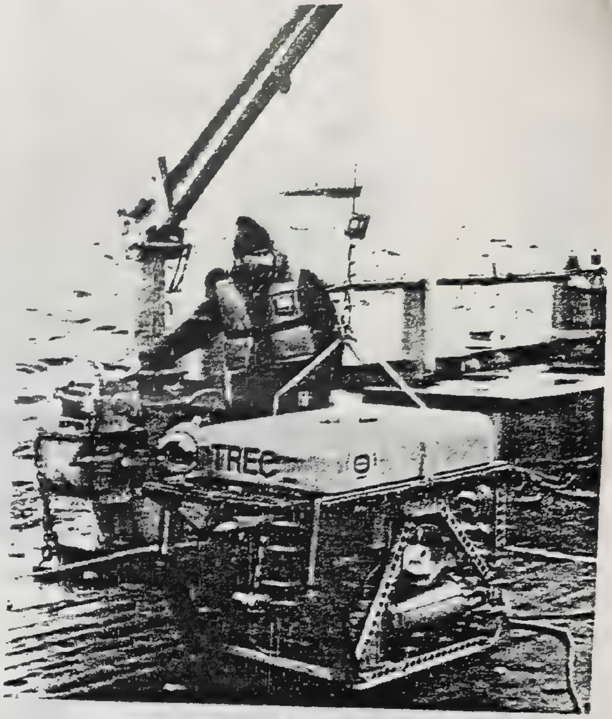
ROVs for Offshore Operations

In 1975 Hydro Products, San Diego, introduced the first commercial ROV since Dimitri Rebikoff's 1953 POODLE. Over 30 RCV-225s (RCV is a Hydro Products trademark) now have been built, employed in inspection/monitoring and in diver assistance.

Like most commercial systems, the RCV-225 is a tethered, free-swimming vehicle. Like other tethered ROVs, the RCV-225 system includes five components: vehicle, launch/retrieval system, umbilical, power source and control/display console.

Four oil-filled electric motors on the RCV-225's small, highly maneuverable frame provide thrust, heave, sway and yaw motions. The vehicle is equipped with a low light TV and lens system allowing remote pitching of angle of view ±90° from horizontal. Viewing range is 10 m without ambient light.

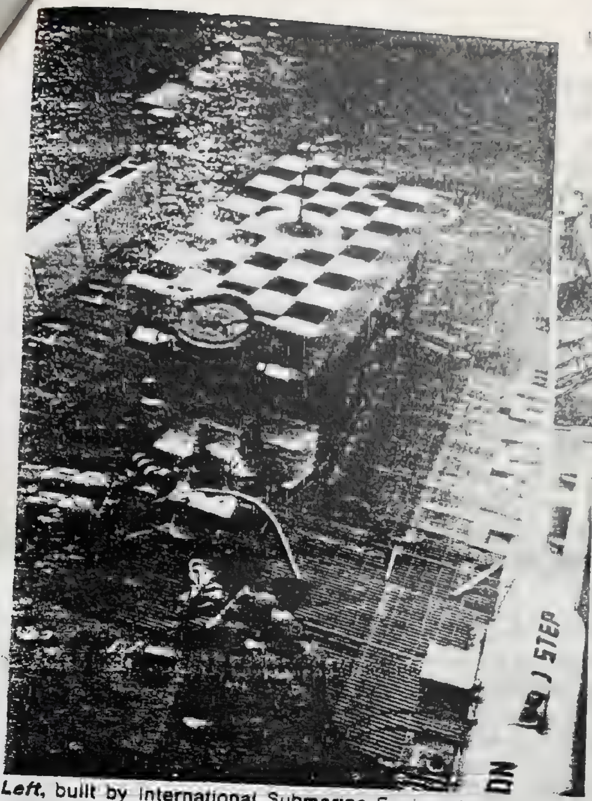
The launch/retrieval system includes a protective launcher with tether, cable winch, deck winch on skid/A-frame and hydraulic power supply. The vehicle goes to working depth in the launcher and then "flies" out.

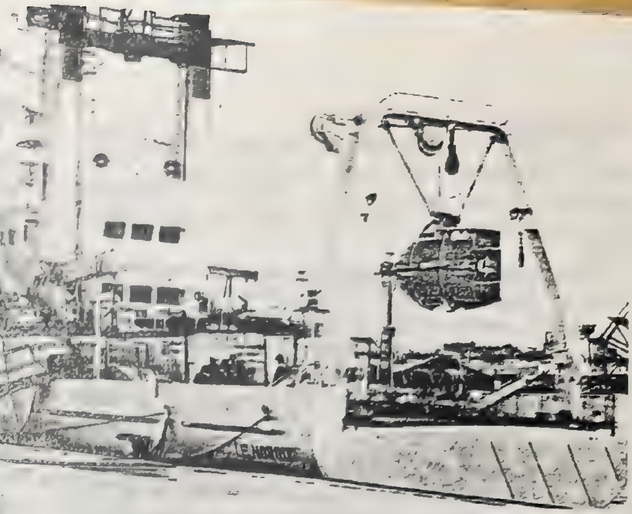


The control console uses a fully proportional joystick. Vehicle depth and heading are automatically controlled, displayed and recorded. Other displays show lens pitch angle, number and direction of cable twists, cable payout and elapsed time. Although working depth is listed as 2,000 m, apparently no job has required operations at more than 400 m. (Hydro Products also recently delivered the first production RCV-150, with manipulator, to Esso Australia.)

International Submarine Engineering, Port Moody, B.C., introduced the first Tethered Remotely Operated Vehicle (TROV) in 1976 and the prototype Tethered Remote Camera (TREC) the following year. TROVs, with an open metal frame typical of most ROVs, mount a manipulator which provides four degrees of freedom. I.S.E. has built about two dozen ROVs and this year introduced the Deep Access Reconnaissance Television (DART), an inspection system whose vehicle weighs only 32 kg. DART costs less than $60,000 (a fraction of other ROV costs) and has made surveys inside a pipeline, according to I.S.E.'s Mike McDonald.

Other commercial free-swimming ROV manufacturers include AMETEK Straza, El Cajon, Cal.; BOC, London; British Aircraft, Bristol, England; Continental Shelf Institute, Trondheim, Norway; Marine Unit Technology, Plymouth, England; Mitsui Ocean Development and Engineering, Tokyo; Kraft Tank Ocean Systems, Kansas City, Mo.; Perry Oceanographics, Riviera Beach, Fla.; Rebikoff Underwater Products, Ft. Lauderdale, Fla.; Remote Ocean Systems, San Diego; Saab-Scania Aerospace, Linkoping, Sweden; Sub Sea





Left, built by International Submarine Engineering and operated by Solus Ocean Systems, this TREC (Tethered Remote Camera) awaits launch during North Sea operations for Phillips Petroleum. ***Above***, the Naval Ocean System Center's Remote Work System operates to 6,000 m depths. ***Above right***, the untethered *Epaulard* system (built for photo surveys at similar depths) completed sea trials last summer for the Centre National pour l'Exploitation des Oceans.

Surveys, Barrow-in-Furness, England; ULS Marine, Gloucester, England; and Winn Technology, Kilbrittain, Ireland.

ROV Configuration and Gear

Most tethered free-swimming ROVs weigh less than 500 kg. All have slightly positive buoyancy (usually provided by syntactic foam) when submerged. Top-mounted vertical thrusters, which maintain the vehicle at a given depth, do not disturb sediments and thus limit visibility.

Generally the vehicles run on surface-supplied AC power (50/60 Hz and 220/240 V) either from ship's power or a dedicated diesel generator. About one-half of operators use dedicated generators, principally because drops in ship's power can cause loss of vehicle control.

Umbilical cables, which carry power and communications, usually are single units with one to three coaxial conductors. Strength members generally are Kevlar. Negative buoyancy is offset by floats.

Some operators attach a short length of line to the vehicle for recovery operations. The umbilical itself will lift most vehicles. Some have a launcher or "clump" for launch and retrieval. Frank Busby says this is desirable in platform work (where the launcher minimizes risk of entanglement) and less desirable in "liveboating", underway operations.

Most ROVs are pushed by propellers, fitted by Kort nozzles on some larger vehicles. Most thrusters are electric; the others are hydraulic. Speeds range up to four knots with an average of 1.6 knots. (This is important mainly for ability to work in currents.) ROVs generally are designed to operate in 1,000 m depths or less.

Commonly, ROVs mount one black and white 525/550-line TV camera. Low light TVs are about as common as standard vidicons. Large ROVs often hold two TVs, one for piloting and the other controlled by the customer. Solus Ocean Systems, Houston, recently ran successful trials of a color TV system which often proved especially useful in low visibility conditions. Sub-Sea and Honeywell both offer 3-D TV.

ROVs carry one to nine lights, usually quartz iodide and in the range of 250 watts. Strobe-equipped 35mm still cameras are common and provide higher image resolution and better color than video does. Stereophotography use is increasing.

About one-third of ROVs have one or two manipulators. Saab-Scania Aerospace's ORCA has one master-slave primary manipulator (with seven degrees of freedom) and two rate-controlled work-assistance grabbers.

Because ROVs represent a small equipment market, gear meant for other uses often is adapted. Instrumentation sets may be modified for each job. Standard gear includes echosounders, directional hydrophones (usually manufactured by Helle Engineering, San Diego), scanning sonar, side scan sonar and subbottom profilers (particularly for pipeline work).

Special tools may be mounted for corrosion potential measurement, ultrasonic thickness measurement, radiographic testing, cleaning and other tasks. Intersub builds a magnetic sensing device that detects pipelines buried up to three meters.

Magnetic fluxgate compasses give an accuracy of ±1°. Directional gyrocompasses, referenced to the magnetic compass, provide an accuracy of ±1° and less than 1°/hr. drift.

Acoustic navigation gear, either bottom- or surface-based, is similar to gear employed by manned submersibles. Navigation within steel structures (which deflect magnetic readings and scatter acoustic energy) presents as-yet-unsolved difficulties.

At the surface, ROVs float with 10 cm of freeboard or less. To aid recovery, they are equipped with a strobe and/or emergency pinger. Several, however, have been lost after drifting out of contact.

Pilot operations are simplified by automatic control and display features—for example, one Intersub ROV recently followed a pipeline automatically for six hours. A Sub Sea TREC system includes a video character generator which displays measured data (such as corrosion potential) digitally on the operator's display.

(Continued on Page 16)

ROV Operations Experience

Inspection/monitoring accounts for about 90% of ROV offshore operations. (This figure is expected to drop with a heavy trend toward specialization.) Average daily operating costs have decreased in the last year from around $3,000 to $2,200.

Some years ago ROVs were advertised as deployable from ships of opportunity but this proved overoptimistic, especially in the North Sea. Ideally, a support vessel should have twin screws and a bowthruster. Dynamically-positioned vessels are considered too expensive. Furthermore, automatic action could damage an umbilical or vehicle. Intersub reportedly plans to make *Intersub Five* the first ROV-dedicated support vessel.

Operations are carried out either anchored or underway. Staying within a prescribed "footprint", the ROV usually works abeam of the vessel (away from screws and bowthruster). "Fixed platform inspection is conducted from a ship or barge tied up to the platform," Busby notes. "Only one North Sea operator, Sonarmarine Ltd., is approved to use the platform itself as a support base."

Most operators launch and retrieve ROVs from conventional ships in up to Sea State Four (above which insurance may not be available). Semisubmersibles increase the capability for RCV-225s operations to Sea State Eight. At least one ROV has been totalled during recovery.

Operations require clear communications among ship's master, ROV pilot, winch operator and navigator. The support crew employs one to seven personnel. Average dive duration is three to five hours. Effective pilot time ranges from one to four hours (or up to eight hours for tasks requiring minimal concentration).

Most support crew members come from electronics backgrounds. Training, unique to each operator, varies from simply assigning personnel to a crew to multi-week courses given by manufacturer and/or operator. Minimal training is considered six months (one season) to a year. Job times and lengths cannot be specified in advance. As Busby points out, wives take a dim view of this and operators face continual recruitment problems.

Tangled and Torn Tethers

Although ROVs perform the required tasks, like anything else at sea they seem particularly prone to Murphy's Law. At least twelve ROVs have been lost. (One was sucked neatly into a bowthruster which produced an expensive shower of metal bits on the other side.)

The ROV's umbilical is the key weakness. There is "a vast potential for fouling every time a tethered vehicle is deployed," Busby says. Among other causes, fixed structures are often festooned with monofilament fishing lines. Other problems include power surges (with motor power dropping, the ROV may become positively buoyant and rise uncontrollably into a platform).

In addition, cables break on contact with structures and other lines. When *ST* visited Busby this fall, he had just returned from ROV trials off New York. Asked how the tests went, he grinned and said the ROV was now doing longterm materials studies 150 m down on the floor of the Hudson Canyon. The cable ruptured against an offshore lobster pot line.

Various procedures minimize umbilical vulnerability (entering structures on a horizontal plane, working on slack tide or from downcurrent side, placing a TV camera so it can scan the umbilical) but none is foolproof.

No Strings Attached

If limitations in power supply and communication/control can be overcome, untethered vehicles would avoid such problems. About half a dozen such vehicles are being developed worldwide, some aimed at offshore applications.

The Centre National pour l'Exploitation des Oceans (CNEXO), Paris, carried out successful sea trials this summer for a three-ton untethered system for surveys to 6,000 m depths. CNEXO's *Epaulard*, equipped with a photographic system, is aimed primarily at manganese nodule survey.

Workers at the Heriot Watt University, Edinburgh, are constructing an untethered ROVER system to operate piggyback from the ANGUS-003 vehicle. Following a multiyear development program, ROVER trials are scheduled for 1983.

In the U.S., the Naval Research Laboratory is working on an Unmanned Free Swimming Submersible (UFSS), aimed at ocean science data gathering and (eventually) seafloor search. UFSS is designed for 460 m depths with an operating range of 125 miles. In longterm plans, lithium thionyl chloride batteries should give a 1000-mile capacity and depth capacity of 6,000 m.

The Naval Ocean Systems Center (NOSC) continues research on a free-swimming test bed vehicle, programmed by an umbilical which is disconnected before the mission. Funded by the U.S. Geological Survey, the test vehicle will perform magnetic pipeline following and other tasks. Another longterm goal is communication with the vehicle via fiber optic or acoustic link.

Engineers at the University of New Hampshire (UNH) have built an untethered vehicle which will follow pipelines via acoustic array. The Experimental Autonomous Vehicle (EAVE) weighs 372 kg and operates up to eight hours. The UNH workers are also investigating communications/control concepts for acoustic links.

At the Massachusetts Institute of Technology (MIT), researchers are building a small search and survey vehicle designed for low acoustic noise. *Robot III*, now in field tests, includes a rubberized fabric (like a wetsuit material) for a protective skin and floodable tank systems for automatic ballast and trim.

Research Needs and Programs

The Busby report lists some areas where ROV technology particularly needs strengthening. A prime demand is for power sources with much higher energy density. Another is for improved communications and control. (Busby points out that for the very short distances often involved, less than 100 m, electromagnetic undersea transmission offers possibilities.) Other needs include increased propulsion efficiency, higher-definition color TV, improved acoustic inspection tools and heave compensation systems.

Some research programs address ROV technology directly. Projects at MIT are centered on telemanipulators and man-machine communication, and applying modern communications theory to the undersea environment. NOAA's Office of Ocean Engineering is sponsoring ROV studies including needs for a diver-assistance vehicle.

NOSC work includes development of the Remote Work System (a tethered two-vehicle system which works to 6,000 m depths) and its highly sophisticated handling system; realtime seafloor mapping with one-cm resolution; a Work System Package for complex underwater tasks, and other research.

In a meeting scheduled for last month, the MIT/Marine Industry Collegium (see *ST* for July, p. 23) sponsored dis-

NOAA CONDUCTING SUBMERSIBLE STUDY OF ATLANTIC MARINE LIFE

To learn more on how human activities affect fish and shellfish of the ocean, scientists from the National Oceanic and Atmospheric Administration have begun surveying marine life off New England and the mid-Atlantic states from a submersible.

Kicking off a two-month series of voyages in support of four research projects, scientists from NOAA's National Marine Fisheries Service have selected a site to be revisited later, and are collecting key "indicator" species - including lobsters, crab, and anemones - for contaminant analysis.

The project is part of a program to keep tabs on the health of the ocean by "taking its pulse." Two areas will be surveyed in the "Ocean Pulse" cruises - the relatively pristine Oceanographer Canyon off New England and the more polluted Hudson Canyon southeast of New York.

The cruises, using a NEKTON submersible and a surface ship, are supported by the Commerce Department agency's Office of Ocean Engineering through its Manned Undersea Science and Technology program. Chief Scientist of the Ocean Pulse missions is Dr. Richard Cooper, % NMFS-NOAA, Northeast Fisheries Center, Woods Hole, MA.

(I would like to inject a comment here to note that the NEKTON people have refused to help with covers for several years now. The greedy ones killed it off for everyone. However, Dr. Cooper has been helpful on several occasions; so , I personally, will try for 2 covers only to Dr. Cooper....Irene)

Following this project, a second series of cruises will support Rutgers scientist Dr. Churchill Grimes in an investigation of the tilefish - a delicacy hunted by sportsfishermen and some commercial operators, but unknown to many people. The scientists hope to learn more about tilefish spawning, which occurs in the summer, and about why catch rates are lower at that time.

A third fisheries investigation will be carried on from the submersible by Dr. R.O. Parker, Jr., of NOAA's Southeast Fisheries Center. Purpose of the cruises is to improve present estimates of the potential yield from important foodfishes of the South Atlantic coast; snapper, grouper, porgy, grunt, and sea bass.

Potential yield usually is computed from analysis of catch and effort statistics from commercial and sports fishermen. Since sufficient data of this nature are not available, the NOAA team is attempting to take a census of the fish as the basis for another method of estimating.

The final series of submersible cruises will support submarine geology observations by D. Alexander Malahoff of NOAA's National Ocean survey in an attempt to obtain a better overall picture of the general geology of the head of Norfolk Canyon. Outcrops along the wall will be sampled, benthic (bottom) organisms will be photographed and their effects on modification of canyon walls recorded, and the effects of bottom currents on upper canyon sedimentology will be studied.

The following is an excerpt from a letter written by Mme. Claudine Durand, owner of Intersub.

"This is to inform you that I have personally purchased the Perry submersible SHELF DIVER, recently sold by auction in Lorient, France, so that it may once again be used by its former crew, now Intersub personnel. They welcome the return of their very first submersible and hope to use it as a training platform for testing of new equipment.

This sub was originally purchased by COCEAN in 1971 and was operated by Jean François Durand and his team for a period of 2 years. It was then sold to the French Navy but was continued to be operated by the same team (Senior Pilot: Bernard Lizé) until 1974.

Since then, Intersub has acquired and now operates 12 vehicles: 10 Perry submersibles and 1 Remote Controlled Vehicle, TROV, and its most recent acquisition, the deep observation sub PISCES V, manufactured by HYCO."

Mme. Durand closes by saying that they all appreciate receiving the ONE HALF FATHOM and enjoy reading it very much.

I also received a press release from Intersub with the following info....dated August 1979....Intersub has been busy in both the North Sea and the Mediterranean. Two long term charters have recently been completed. The first: Texaco in the North Sea where two submersibles operating from the support vessel INTERSUB FOUR have given assistance during the laying of the TARTAN-CLAYMORE pipeline and the installation of the TARTAN platform, including full Inertial Navigation surveys of the piperoute and pipelay (requiring at one stage 62 hours continuous bottom time in a back-to-back mode), spoolpiece measurements, and an as-laid pipelogging survey.

In the Mediterranean, INTERSUB THREE with two submersibles on board: the 3,000' PC 16 and the PC 1205, for SNAM with continuous assistance to the deepest pipelay to date and with the laying and installation of hydraulic pipe supports.

Intersub recently introduced into service an ACOUSTIC WELD INSPECTION SYSTEM which was successfully demonstrated to a number of oil companies during trials in Peterhead and is now available for operation offshore.

Their LOCKOUT BREATHING SYSTEM is also now operational and will allow very large savings in diving gas costs during lockout contracts. The system also guarantees that gas is no longer a limiting factor in the duration of lockout dives.

TROV has completed operational trials with her dynamically positioned support vessel INTERSUB FIVE and was to start operational contracts during August.

PISCES V will be refitted in order to bring her up to Intersub standards for underwater interventions in water depths down to 6,600'.

Intersub owned and operated submersibles are: PC 8, PC 1201, PC 1202, PC 1203, PC 1204, PC 1205, PC 1801, PC 1802, PC 1804, PC 16, PISCES V, SHELF DIVER, and unmanned TROV. Mother ships are: INTERSUB ONE, INTERSUB TWO, INTERSUB THREE, INTERSUB FOUR, and INTERSUB FIVE.

Man, Girl Rescued From Leaky Yellow Submarine

20-Day Ordeal Ends When Freighter Finds Them Off Oregon Coast

SEATTLE (UPI) — James Ringrose, 37, and Nicole Rowley, 7, were a quarter mile off the Oregon coast in a homemade yellow submarine when "everything went wrong," Ringrose said yesterday — 20 days later and safe and snug here.

As Ringrose and Nicole drifted farther out to sea in the leaky, half-submerged 17-foot craft, they sang songs like "Yellow Submarine" and watched the fish to keep each other's spirits up, he said.

Ringrose, of Depoe Bay, Ore., an adventurer who once was on the FBI's most wanted list, and Rowley, of Gresham, Ore., a daughter of Ringrose's girlfriend, were the objects of a massive search. They were spotted Friday night by a passing freighter, the Chavez.

When the Chavez sighted the pair at 9:20 p.m. Friday, it was 35 miles west of Cape Disappointment and off the mouth of the Columbia River.

Crewmen took the man and girl off the sub and continued toward Seattle. As the freighter neared the city, a Coast Guard launch picked up Ringrose and Nicole and brought them to the Coast Guard district administration building.

The girl's mother, waiting at the pier, greeted her daughter as she was carried ashore by a Coast Guardsman.

"We're OK," Ringrose said on the Chavez by ship-to-shore radiotelephone. "Our motor quit and we were driven out to sea by an east wind. We were anywhere between 30 and 50 miles offshore the whole time. We had a little food."

The two kept their spirits up by making up stories, singing songs and talking about Christmas.

"We sang 'Rudolph the Red-Nosed Reindeer,'" he said. "One of our favorites was, 'We All Live in a Yellow Submarine.' Another was, 'We Sailed the Sea of Dreams.'

"Nicole was very brave," he said. "She never doubted that she'd see her mother again. She liked to look out the window most of the time, watching the fish swim by."

The submarine was partially submerged, making it difficult for rescue craft to see it, and Ringrose said he saw many ships go by. His craft was equipped with emergency rations and reserve water tanks.

"We'd ship a little water, but most of the time it was pretty dry. The leaking started after the first storm, but there was a hand bilge pump. We made a game of pumping the bilges."

The ship's officers reported the 17-foot-long, abandoned submarine would probably sink in a few hours.

Upon hearing of the rescue, Sgt. Phillip Mohn of the Oregon State Police said in Newport, Ore., that "all of his friends told us this was going to happen. They said, 'Hey, he'll show up — we know him.'"

There was no request for medical assistance for Ringrose and Nicole, but physicians stood by in Seattle to give them physical examinations.

Oregon State Police said they were told that officials of Oregon's Multnomah County would seek to place the girl under protective custody on her arrival in connection with a complaint involving the mother.

Ringrose and the girl left Depoe Bay Nov. 10, apparently to search for an experimental buoy built by Ringrose. The buoy, which disappeared in an October gale, was designed to determine if it is feasible to generate electricity with wind and wave motions.

A two-day search by the Coast Guard failed to find the submarine, built out of boiler plate and 55-gallon drums. It was finally found 100 miles north of Depoe Bay.

After the submarine disappeared, it was discovered that Ringrose once was on the FBI's most wanted criminal list and that he was arrested in Osaka, Japan, on March 29, 1967. He served time at the Terminal Island Federal Correctional Institution in California for transportation of stolen property.

His brother, Michael Ringrose of Burbank, Calif., said James, born in Iowa City, Iowa, was widely traveled.

"He holds the record of having traveled the longest distance — 7,000 miles — while a fugitive," said Michael Ringrose, quoting from "People's Almanac."

"My brother has distinct talents. He can charm virtually anyone, and he has a knack for snatching defeat from the jaws of victory."

Ocean Cosmic Ray Engineering Physics Experiments

Kurt Stehling
Senior Scientist
Manned Undersea Science and Technology Office
Office of Ocean Engineering, NOAA

The detection and analysis of cosmic radiation has motivated a series of undersea submersible missions, beginning October 5-8, 1977, off "West End," Grand Bahama Island. Innovative applications of undersea technology and engineering have been the distinctive features of these experiments, which have been mounted at, roughly, six-month intervals since 1977.

A University of Washington—Western Washington University cosmic ray scientist has been the senior experimenter, supported during these missions by NOAA: OOE/MUS&T, and Office of Sea Grant, with MUS&T's Kurt Stehling as scientist observer, coordinator and experiment monitor. The private Harbor Branch Foundation, Inc., Ft. Pierce, Florida, generously provided most of the ocean engineering and operations support in the form of the Johnson-Sea-Link II(JSL) (See Figure 1) submersible and a "cosmic chamber," (Figure 2) among other things. The cosmic ray scientist locked-out two stacks of sensitive photographic emulsion plates or "pellicles," packaged inside Benthos Corporation glass spheres (Figures 3 and 4) into a chamber sitting on the ocean bottom at 1080'. Twelve 6'' x 6'', 1/16'' thick glass plates were coated first with liquid photographic emulsion, and then dried by the University of Washington's Dr. Peter Kotzer, who, with Harbor Branch's Richard Roesch, operated in the rear lock-out compartment of the JSL, which was locked onto the cosmic chamber. I was in the front plexiglass pilot sphere from where I monitored the procedures. The reason for preparing the photographic emulsions in-situ at 1000' instead of on the ocean surface was to prevent "fogging" of the plates by the ever present dense surface flux of "unwanted" nuclear[*] and extra-nuclear[†] (e.g., electrons) particles.

The ocean water is an isotropic and homogeneous filter, which at depths below a few hundred feet, filters out most cosmic ray particles except, for these experiments, detection sensitivity, "muons" or heavy electrons, which are important end products of the cosmic ray flux, which consists at these depths mostly of neutrinos, which produce concomitant muons.

The stacked emulsion pellicles, usually six in each sphere, are left for several months on the ocean floor[‡] where the silver halide film accumulates "tracks" resulting from muon collision processes within the sensitive granular structure of the films. The emulsions are developed in the JSL, again in-situ, for the same reason as above, and then are shipped to the University of Washington's Physics Laboratory for analysis and measurement, with a microscope, of the collision events' tracks.

These unique, if not historic, experiments, were attended by a number of novel features of undersea technology and ocean engineering, as follows:

1. The Harbor Branch Foundation designed, built, tested, and then deployed on the 1000'-depth ocean bottom, an aluminium lockout chamber which became the receptacle for the glass sphere emulsion cassettes. The other locked-out glass spheres were moved by the submersible to 400' and 600', for reference purposes. The chamber, a "spare" JSL lockout compartment having a 6000' crush depth, was mounted on a support structure (Figure 6).

2. Benthos Corporation glass spheres of 9'' diameter were used for the emulsion stack housings, with the pellicle stacks placed inside in a manner which maintained a vertical orientation. The stacks were enclosed in a black, opaque plastic box to prevent stray light from fogging the emulsions. The glass hemispheres were then sealed with special tape. The edges are ground to almost "gauge-block" tolerances, so that with clean surfaces, water leakage is essentially impossible at depth, even without sealing tape. After Mission No. 2, Spring 1978, it was decided to flood the spheres with helium, and add desiccant, before sealing, in order to reduce long term emulsion fading, due to oxidation and high humidity.

---

[*] Hadrons —eg neutrons protons, etc

[†] Leptons —eg electrons, positrons etc

[‡] One sphere was left in the docking chamber at 1000' and the other was placed for reference purposes, at 400' in 1977. In the Spring of 1978 the 400' sphere was recovered, and the 600' sphere in May 1979

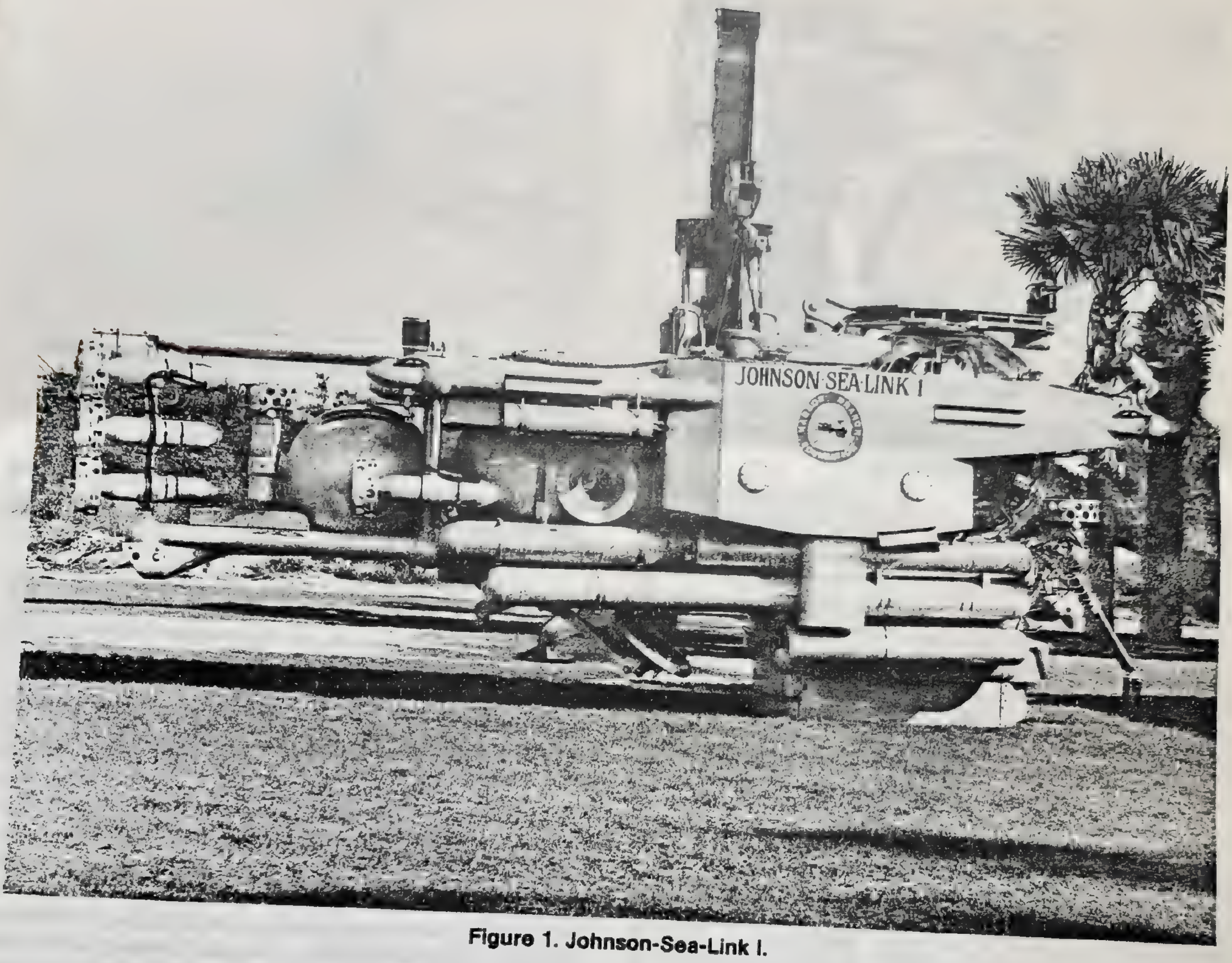


Figure 1. Johnson-Sea-Link I.

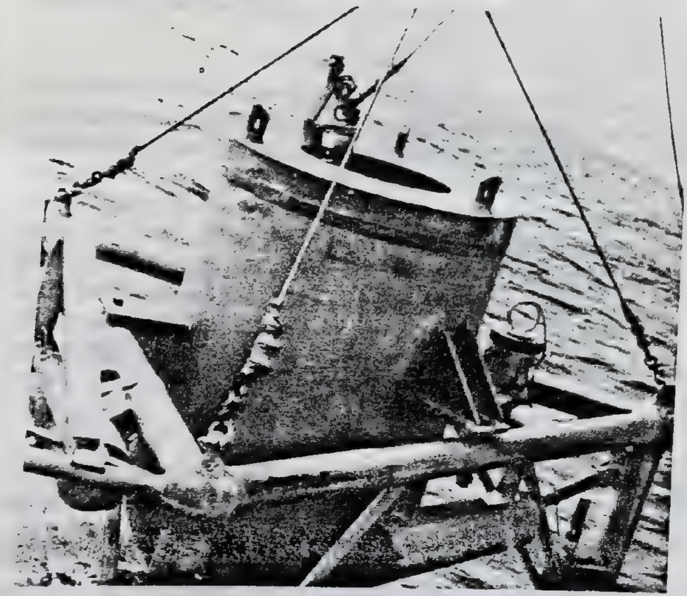


Figure 2. The "Cosmic Chamber" designed by Harbour Branch Foundation being lowered to the ocean bottom off West End, Grand Bahama Island.

3. Several novel emulsion treatment apparatus were also designed and built or provided by Harbor Branch engineers and technicians:

- a drying "oven" for drying the emulsions in a thermostatically controlled low-humidity atmosphere. They also provided special desiccant containers.
- several cooling and washing and storage receptacles.
- a "level-table" whose heat transfer cooling fins were immersed in an ice-water solution, keeping the table at, essentially, 32-34 degrees F.
- an insulated box, containing the equipment used for developing, washing and fixing the emulsions (at 1000' depth).
- miscellaneous timers, red photo-lights, stirrers, magnifiers, etc. The pouring, coating and drying of the Kodak emulsion within the rear JSL chamber is an uncomfortable and tedious process; some dives have taken as long as 10-11 hours, from time of launch of the JSL from the R/V Sea Diver or R/V Johnson (Figure 7) until return. The cosmic chamber has a sonar pinger installed which aides the JSL pilot(s), Jeff Prentice or Tim Askew, in locating the chamber, once the JSL reaches bottom.

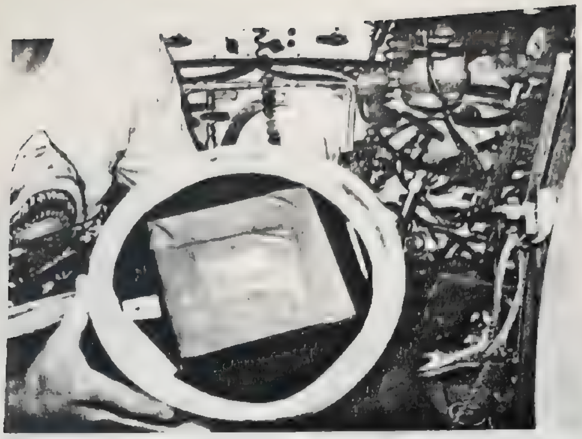


Figure 3. The emulsion stack (wrapped in tape) being placed inside the glass sphere cassette in the rear of the Johnson-Sea-Link.

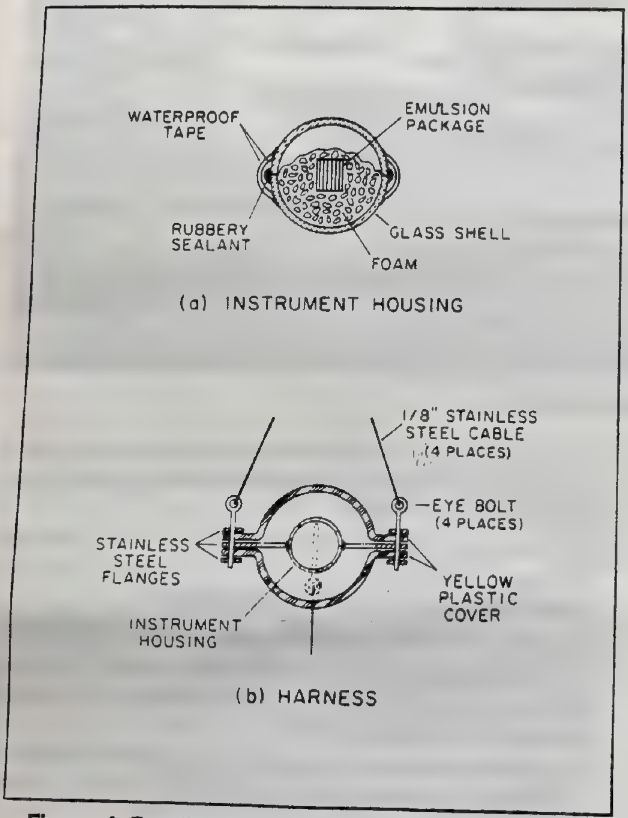


Figure 4. Details of the "packaging" of the emulsion stacks (pellicles) within the glass sphere.

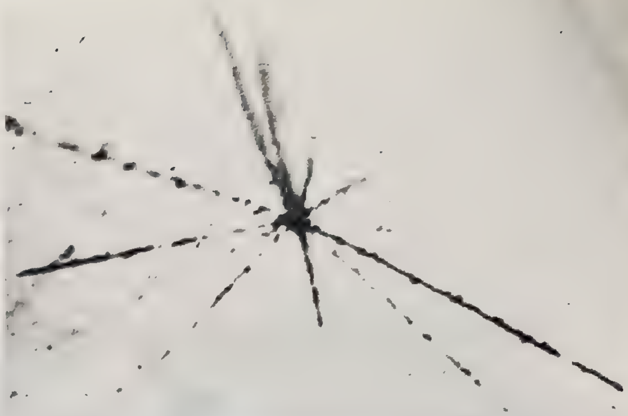


Figure 5. The collision of a muon (or "mu-meson") with a proton, as observed through a microscope, within the granular structure of an emulsion, exposed to cosmic ray flux underwater.

This task is made easier since the surface support ship can position itself, via Loran C reference, almost on top of the site. The 1000′ spheres, within the cosmic chamber (which is covered by a plastic lid when not locked on, to prevent residence of fish inside with the cassette) are of course available without search. The reference cassettes at 400′ (in 1978) and at 600′ (1978-79) are located by the JSL via predetermined compass headings, as well as line-of-sight.

The history of undersea cosmic ray detection by photo emulsions prepared in-situ goes back to early 1972 when I suggested to University of Washington scientists that the HYDROLAB habitat, then located off Grand Bahama Island, could be used as a "residence" or lab for cosmic radiation experimenters wishing to put some water between them and the sky, for filtering. This suggestion was considered novel at the time; electronic detectors which do not reveal the exact nature of cosmic particles or integrate the particles' collision events in the same fashion, had been lowered in the past beneath the sea from time to time. A mine site would, of course, also interpose a filter or shield between the detector and the sky. However, the overburden is not homogeneous or isotropic and there is much natural radioactivity. The last drawback is inconsequential for the detection of certain elusive particles such as solar neutrinos.

After some years of HYDROLAB work with P. Kotzer, it became evident that the shallow operating depths at, or near, HYDROLAB (50′—200′) precluded much data acquisition; more depth—at least 1000′—would be needed before significant muon stopping (within the emulsion) processes could be observed. I persuaded Edwin Link of the Harbor Branch Foundation in 1976-77 to consider the notion of using the JSL for emulsion processing and, somehow, locking out emulsion cassettes: these being the afore mentioned "Benthos" glass spheres which are inexpensive, cosmic ray "transparent" and very water-pressure resistant, and do not corrode.

In 1977, E. Link and S. Johnson, the president of the Harbor Branch Foundation, in consort with the recommendations of their own staff especially Bob Jones, Director of Science Laboratory, and those of their review and advisory groups agreed to the use of the JSL. Jean Buhler, Director of the Engineering Lab and his staff, with Roger Cook, Director of Operations, (who suggested the cosmic cham-

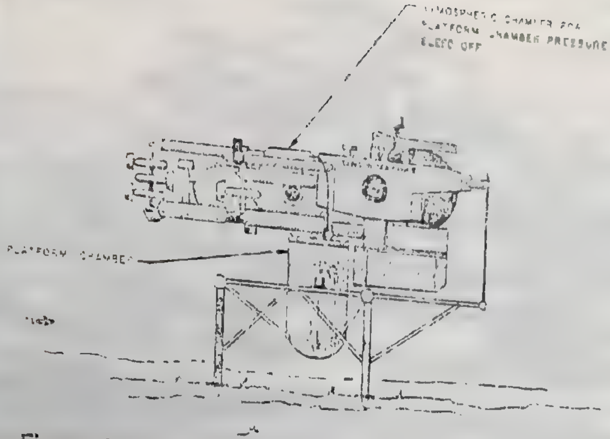


Figure 6. Schematic of sub and platform chamber for dry transfer of pellicle plates.

ber) then proceeded to design and build the necessary support equipment described earlier.

The transfer of the cassettes is done at atmospheric pressure; once a lock-on seal is achieved (the JSL bottom hatch flange was slightly modified to permit a mating/sealing contact via a "split" O-ring with the cosmic chamber) the 1000 ft. pressure is relieved in the cosmic chamber's interior and the extension of the aft JSL rear dive chamber's hatch, by venting into the dive chamber's bilge. A little water squirts out and then atmospheric equilibrium is achieved. The sub then sits solidly and firmly on the cosmic chamber. It is brought down, by the way, onto this chamber by two guide rods engaged by two V-cups on the JSL.

The cosmic ray data obtained so far from the HYDROLAB and especially the JSL experiments, while not historic, have yielded solid evidence of new types of muon interactions, yielding further clues to the composition and origin of cosmic rays. The undersea experiments have had other unexpected fall-outs. The ONR are now interested in neutrino (massless and chargeless sub-nuclear particles) propagation through the earth into the oceans from a neutrino "generator" such as the Fermi accelerator Laboratory, Batavia, Illinois. The neutrino beam, which easily passes through the earth, could (maybe) carry interception-proof message data to our nuclear (and other) submarines.

Also, various high-energy physicists and astrophysicists, have suggested a giant deep-sea neutrino "telescope" or detector (Figure 8). That, unlike the JSL experiments, is "BIG PHYSICS" and will need multi-million, multi-agency support. However, it is intriguing to note that a greater consciousness among the physics community of the oceans' potential as a "physics laboratory domain" may lead to some new, and perhaps, dramatically productive, physics and engineering physics. We are pleased that the modest HYDROLAB experiments of the early 70's, and now the JSL missions, may have helped to arouse this consciousness.

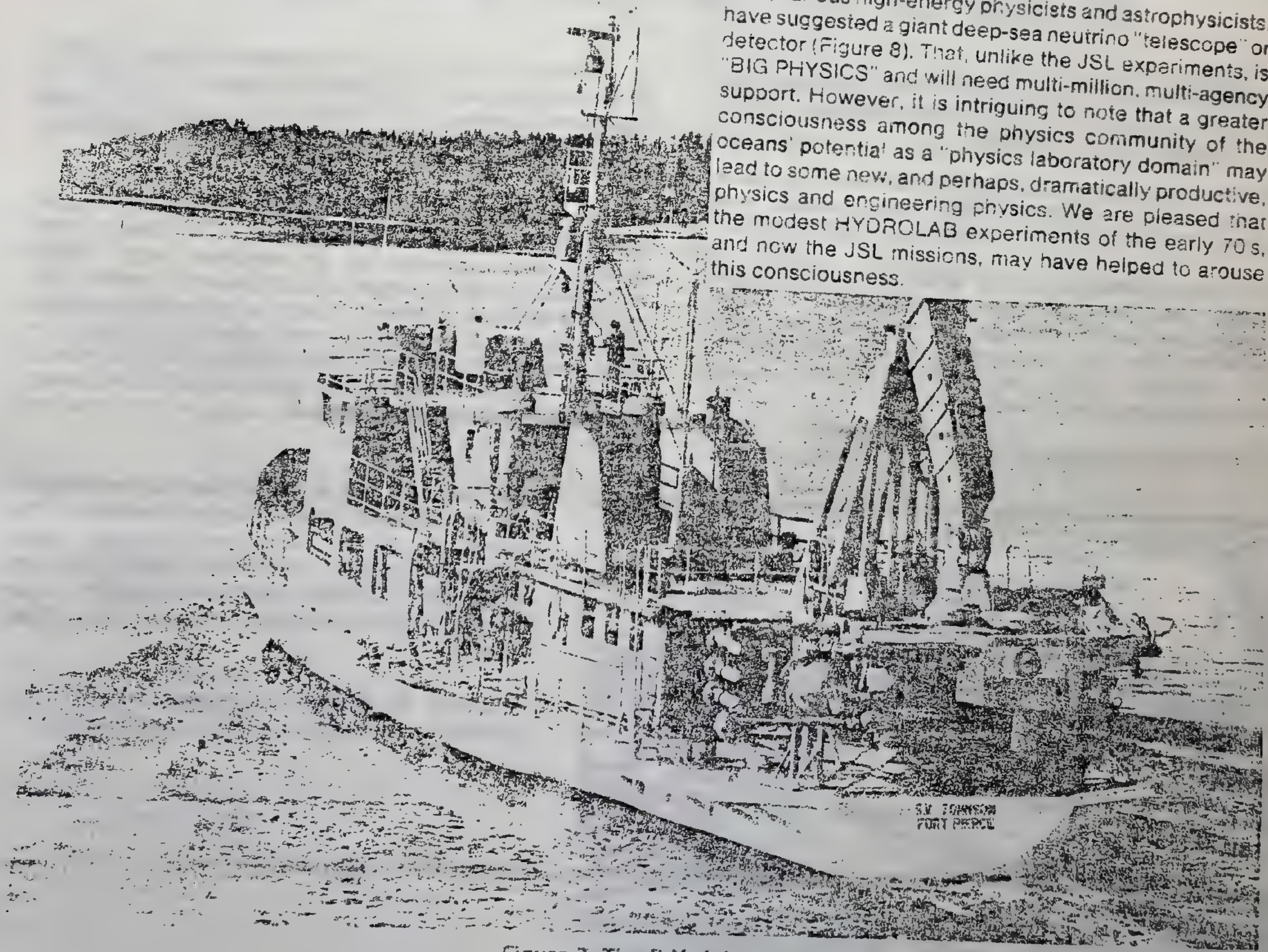


Figure 7. The R.V. Johnson.

MANTIS PROVES A WINNER

OSEL Mantis Submersible Aids Royal Navy in Search for Tornado Wreckage

The recent fatal crash of a Tornado aircraft in the Irish Sea brought an urgent call for help from the Royal Navy to the OSEL Group in Great Yarmouth.

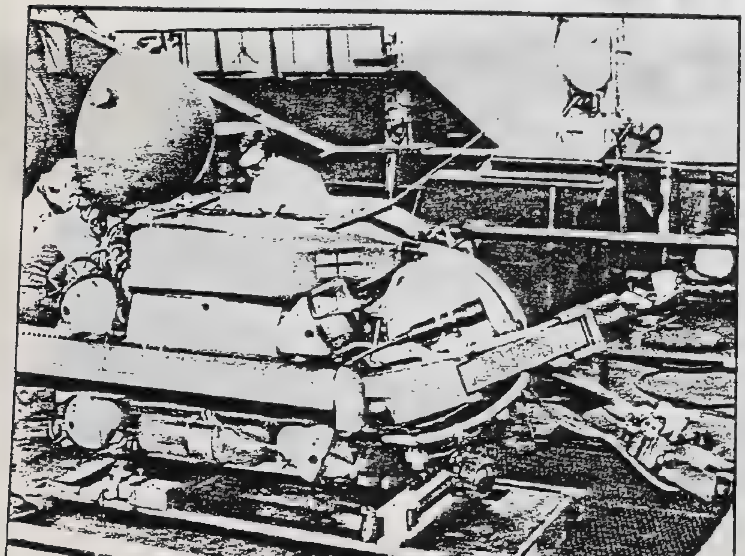
The divers were being hampered in their search for parts of the wreckage by strong tides, poor visibility and severely restricted time on the sea bed, due to the depth.

OSEL were commissioning their latest submersible in the "Mantis" class, for a new operating company — HMB Subwork Services Ltd.. The call for help was acted upon immediately, and the brand new sub was mobilised to H.M.S. Reclaim; OSEL provided the hardware and Subwork the operational management.

The first dive commenced at 6 p.m. on Thursday July 3rd.

By Sunday July 8th, eleven operational dives totalling 39½ hours had been completed. For search purposes one Mantis had spent as much time on the sea bed as a team of twenty-five divers working round the clock could have done.

The tremendous saving in diving time was used to good effect. Each piece of debris grasped in a Mantis manipulator was examined by an engineer from British Aerospace, using the closed circuit television system. The engineer decided whether it should be left or retrieved; the Mantis itself recovered small items weighing in total up to 80lbs using a plastic bread basket strapped to the front of the submersible. If retrieval of bigger pieces was necessary the Mantis marked the piece by using a shot line and buoy.



The shot line had a pinger fixed at the bottom, and was lowered from a Gemini work boat. The Mantis conned the Gemini onto location using its pinger locator. When the Mantis dive was completed, the diving team went straight down the shot line and attached ropes to the pieces marked.

The rate of retrieval increased tenfold using Mantis, to the delight of B.A.C. and the R.A.F.

ADDRESS LIST-CORRECTIONS AND ADDITIONS -JANUARY, 1980

de FROBERVILLE, Gerard C.
BUS: Chef de Service de L'Industrie et
L'Artisanat, Directeur du Bureau
de Developpment, Conseiller
Scientifique et Technique du
Conceil de Gouvernement de
Polynesie Francaise
BP 2900, Papeete, Tahiti

JOHNSON, Philip E.
add:(Associate Member)

KEACH, Don I.
delete:(Associate Member)

MACDONALD, Michael D.
RES: #2102, 3700 Watonga
Houston, TX 77092
(713) 681-8816

MUELLENHOFF (delete)

PLANCON, Jean-Marc
(Capitaine de Corvette)
(ARCHIMEDE, GRIFFON)
RES: Villa "Creole", 291 Av. Marcel CASTIE
83000 Toulon, France
(94) 41-12-20
BUS: DIV/VISM-GISMER
83800 Toulon Naval Station, France
(94) 02-00-12

RAU, Ronald Edward
(ex-DSRV I, II)
RES: 10325 Rancho Rd., La Mesa, CA 92041
(714) 464-0376
BUS: Lockheed Ocean Laboratory
3380 N. Harbor Dr.
San Diego, CA 92101
(714) 298-8245

REES, Bob G.
(Commander, USN)
(ex-TURTLE)
RES: 3714 Amaryllis Dr.
San Diego, CA 92106
(714) 233-1342
BUS: Staff, CSDG-1
FSPO, San Diego, CA 92132
(714) 225-6583

STARR, Robert J.
(ex-PISCES)
BUS: Underwater Services, Inc.
2205 Hayes Rd., #5504
Houston, TX 77077
(713) 974-0680

VADUS, Joseph
(non-member)
BUS: Office of Ocean Engineering (OE-2)
NOAA, 6010 Executive Blvd
Rockville, MD 20852

VETTER, Thomas G.
(ex-TRIESTE II)
RES: 13956 Hollowgreen Dr.
Houston, TX 77063
(713) 493-3402

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

APRIL, 1980

Vol. XIV, No. 2 Published by the Deep Submersible Pilots Ass'n

The Deep Submersible Pilots Association was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to:

Robert K. R. Worthington
Editor & President, DSPA
3005 Curie Street
San Diego, CA 92122
(714) 453-1158

or

Donald E. Saner
Secretary, DSPA
4707 Berwick Drive
San Diego, CA 92101
(714) 278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman, DSPA
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

Five new members are welcomed on board the DSPA this quarter.
George Ellis piloted TRIESTE II and now is an ALVIN pilot.
Ralph Hollis is Chief Pilot of ALVIN.
Craig De Weese was an early NEKTON pilot.
John Schiltz was a pilot in SEACLIFF and TURTLE.
Dick Otter is an old hand of DEEP STAR and PISCES submersibles and has been diving his SEA OTTER for quite a while. I would particularly like to have news from Dick to pass along in the next NEWSLETTER.

Steve Boulton's last NEWSLETTER mailing was returned to DSPA marked "GONE AWAY". Any Member knowing his whereabouts please advise me or ask Steve to communicate with me.

Offshore Technology Conference, May 5-8, in Houston, has scheduled three conferences on "Submersibles". As far as I know, DSPA is not represented among the speakers at any of the three. Please , any DSPA Member attending, send me any information that becomes available there. I anticipate, of course, a report from Larry Megow.

SECRETARY'S REPORTS AND NOTICES

DSPA Annual Dues--If you have not paid the amount indicated on the first page of the January NEWSLETTER, YOU ARE NOW IN ARREARS: Please pay up! Note that those who joined near the end of 1979 were considered paid for 1980.

Elections for 1981--Please send in your nominations now for the consideration of the Nominating Committee to be appointedthis month.

DSPA San Diego Luncheon Meetings

1/18/80---Met at 1145 at Mexican Village, Coronado, CA.

Members Present

Bob Worthington
Ron Rau
Will Forman
Don Saner
Doug Privitt
Jack Bennett
John Cameron

Non-Members Present

LCdr Paul Bienhoff-OIC DSRV MYSTIC
Lt(jg) Dave Gibson- " "
L.L. Willner - " "
P.T. OBrien - " "
Ken Privitt-MARFAB
Craig DeWeese- "
John Schiltz- SEACO, Inc.
Marvin Ehrlich-AUGUSTE PICCARD
Tod Slaughter- "
Alan Smith-DEEP QUEST
LCdr Doug McKinney-OIC SEACLIFF

New DSPA Member Ron Rau was welcomed on board.

No other business was conducted.

After lunch, the meeting adjourned to the Submarine Repair Unit at NAS North Island for a tour of the facility, including DSRV MYSTIC which was in Rescue Standby status and R/V SEACLIFF which was torn down for overhaul.

Next meeting scheduled for 19 February at Tarentino's in San Diego.

2/19/80---Met at 1145 at Tarentino's.

Members Present

Bob Worthington
Jack Bennett
Jerry Shiller
Don Saner
Will Forman
Don Rosencrantz

Non-Members Present

Paul Bienhoff- MYSTIC
Pat O"Brien- "
Dick Hall- AVALON
Doug McKinney- SEACLIFF
Alan Smith- DEEP QUEST
Fred Wagner- AUGUSTE PICCARD
Mel Wills- TRANSQUEST

Bob Worthington read a letter from Don Walsh;
reported he had written to Alan Whitfield regarding formalizing the DSPA-IUPA relationship;
announced dates of forthcoming symposiums of interest;
brought up the possibility of associating DSPA with the San Diego Engineering Society.

Jerry Shiller reported that NEKTON was preparing for an airlift.

Next meeting scheduled for Tuesday, 18 March at Tarentino's.

3/18/80---Met at 1145 at Tarentino's.

Members Present

Bob Worthington
Jack Bennett
Will Forman
Don Saner
John Cameron

Non-Members Present

Tod Slaughter- AUGUSTE PICCARD
Harry Cowles - "
Tom McClay-DSRV AVALON
Dick Hall- "

Bob Worthington read letters from Jack Donnelly and one David Goetz of San Diego who wished to know how to become a Deep Submersible Pilot.

Will Forman announced acceptance of new Members George Ellis, Ralph Hollis, Craig DeWeese, Richard Otter, and John Schiltz.

Jack Bennett introduced Harry Cowles, new crew member of PICCARD.

Don Saner reported DEEP QUEST's test fuel cell power unit is finally enroute back from the factory after its latest fix.

Next meeting scheduled for 15 April.

REPORTS FROM MEMBERS

Jack Donnelly (2/18/80)

"I take this opportunity to submit my dues for 1980 and give you an update on ALVIN's activities.

LULU, with ALVIN on board, returned to Woods Hole on 15 February after 482 days away. During this cruise, they spent more than 320 days at sea and made 163 dives. Seventeen ports were visited, many more than once. on January 15th, the 50th Anniversary of Woods Hole Oceanographic Institution, ALVIN made dive number 1,000 in the Galapagos Rift Zone. Ralph Hollis was pilot, Alex Malakoff of NOAA and George Braderson were the observers. "Bradie" has been with ALVIN from the construction phase and as crew chief is well known to all who have made a sea voyage with our submersible. During the next two and one half months, both ALVIN and LULU will undergo a brief overhaul here. We plan to replace the syntactic foam forebody and make some other minor improvements. Early May will bring departure for tests in Bermuda and then another operating season.

I hope everyone had an opportunity to see National Geographic's TV special, "Dive to the Edge of Creation". We are proud to have contributed to that excellent production."

LARRY MEGOW
3342 ARBOR
HOUSTON, TEXAS 77004
713-522-3342

January 20, 1980

A book review
COLD IS THE SEA
by
Larry Megow

Cold is the Sea is a suspense filled novel that every ex-navy submariner--in fact every one interested in the seas--will find spell-binding.

It's a dramatic, thrilling and detailed episode of one of the United States' most advanced nuclear powered submarines carrying more explosive power than all the munitions used in two world wars by both sides.

The sleek ship is sent on a secret mission to explore, under the ice, the northernmost tip of the USSR. Without warning, she is attacked by an alien sub, damaging her propellor beyond repair.

A sister ship is sent up from New London, to attempt to tow the damaged ship back to port using a cable tow line stored in the aft torpedo tubes.

The hookup is successful, but while in tow a Russian sub attacks and mortally damages the first sub, but not until both our subs were able to break up thru the ice and transfer all but the captain and six of his men. The super sub then crashed to the bottom of the artic in 12,000 feet of water.

The second sub, while limping back to port, discovers a Russian Nuclear Missile station in the ice. We are able to destroy themissile silo as well as one of the Russian subs.

Altho COLD IS THE SEA is a novel the author Edward L. Beach uses familiar names and places--New London, Grotten, Electric Boat, Pentagon, Idaho Falls and Special projects.

The gripping adventure includes a detail description of how a nuclear sub functions as well as a description of the Navy's training station 100 miles our of Idaho Falls.

One different aspect of the book is that the author used no four letter words.

COLD IN THE SEA is published by Dell. Its author is Edward L. Beach.

You'll like it too.

Kill your bills — and yourself

"I have discovered an absolutely free and foolproof way to reduce your electric light bill to zero!" Larry Megow writes exuberantly.

Well now, THAT'S the way to start off a New Year.

Megow is an engineer, with an inquiring mind, and always coming up with little shortcut ways to improve life. After reading the rest of his letter, though, I am not so sure that he has scored a goal this time.

"All you have to do," he writes, "is to hook up a mini-electric generator to your home bicycle exerciser with an old fan belt. By pedaling at 6 miles per hour you can generate enough electricity to light up a 50-watt bulb. At a rate of 10 mph you can light up TWO 50-watt bulbs."

That's the good news. As usual, there's bad news, too. And here it is:

"But if you want to keep four 50-watt bulbs lit for a full day you will have to pedal at 18 mph for 28 hours. In keeping those four bulbs lit for 24 hours you'd have to pedal the equivalent of 504 miles. Yup, free electricity."

However, to close on an encouraging note, Megow reminds that "You'll be getting all the exercise you need to keep yourself healthy." Sure, unless you pedal yourself right into a cemetery lot.

Scripps Grows Tiny Deep-Sea Bacteria In Lab

By YVONNE BASKIN

Staff Writer, The San Diego Union

In pressurized stainless steel "incubators" immersed in icy water, Scripps Institution of Oceanography scientists have succeeded for the first time in sustaining some of the tiniest life from the deepest regions of the ocean.

The creatures are bacteria accustomed to living in the near-freezing waters and high pressures more than 3½ miles beneath the ocean surface. Previous attempts to keep such bacteria alive in laboratories have been unsuccessful.

A. Aristides Yayanos and his colleagues described in a recent issue of the journal Science their success in isolating and growing colonies of these bacteria for more than a year.

"We feel that it is a significant breakthrough to be able to cultivate a rapidly growing barophilic (growing best under high atmospheric pressure) deep-sea bacterium," Yayanos said.

The colonies will be used to develop a better understanding of the processes of life in the deep oceans and to study the effect of radiation exposure on deep-sea life. Yayanos foresees other possible uses for these colonies, from industrial processes to recombinant DNA research.

In cultivating the bacteria, Yayanos found that temperature is apparently more critical than pressure.

"At normal room temperature and atmospheric pressure, a culture of a million cells will die in a few hours," he said.

The same thing happens at a high pressure (580 atmospheres) and room temperature.

The bacteria thrive best at a combination of high pressure and low temperature (2 to 4 degrees Centigrade). They will grow at low temperature and normal pressure, but their growth is considerably slowed.

"We have work now in process with some bacteria we think won't grow at all at normal atmospheric pressures," Yayanos said. "They are from depths in excess of 6½ miles, the greatest depths of the oceans.

"From these we should begin to get a pretty good idea of what's necessary to adapt to deep ocean conditions. We might also begin to learn the role these bacteria play in the deep oceans, whether or not they are part of the food chain.

"It's surprising how much of marine bacteriology is based on cultivation at normal temperatures and atmospheric pressure."

The deep sea is filled with shallow-water microorganisms that fall there. Cultivation at room conditions makes it difficult to tell which are the true deep-sea inhibitants and which are shallow-water contaminants, he said.

Yayanos collected bacteria as part of another project funded by the National Science Foundation to try to sustain larger deep-sea animals, shrimp-like crustaceans called amphipods.

Baited traps the size of a small suitcase were lowered to the sea floor with weights, which released at a preset time 10 to 30 hours later and allowed the trap to float to the surface.

Pumps recirculated cold water through the nine-inch pressure chamber of the trap, and the animals could be studied through little windows without loss of pressure.

Yayanos said 16 days was the best survival time they were able to achieve with amphipods.

After they died, the traps were kept sealed smd pressurized for five months. The scientists then collected bacteria thriving in the decomposition process.

The bacteria were grown in silica gel and nutrient medium in pressure vessels — stainless-steel cylinders of various sizes — kept in refrigerated water baths.

Yayanos and his group — Ron Van Boxtel, Allan S. Dietz and Kristin Jones — also have begun to explore freeze-drying as a means of preserving bacterial colonies for research.

"We do get recoveries, but not consistently," he said.

The bacteria were collected from many parts of the ocean, ranging from 150 miles off the San Diego coast to the Marianas Trench off Guam.

The radiation studies will be part of a Department of Energy program to determine the environmental and technical feasibility of isolating high-level nuclear wastes under the floor of the deep sea, including possible effects of leakage.

"The effects of radiation exposure have been studied in shallow-water organisms but never in deep-sea creatures," Yayanos said.

He said it is conceivable that some enzymes from the bacteria "might have the characteristic of operating at low temperatures and might be important in some industrial processes."

They might also have a place in the emerging technology of ion-specific electrodes, which use bacteria or bacterial enzymes to monitor certain compounds. Some of these bacteria might provide a viable alternative for potentially hazardous recombinant DNA work, he said.

Fears have been expressed that genetic engineering might produce colonies of dangerous hybrid organisms. Since the deep-sea bacteria couldn't survive in humans or probably even outside special lab vessels, he said, they would pose no such threat.

Inquiry into divers' deaths prompts new UK guidelines

Diving firms have issued new operating guidelines and the Department of Energy has made several recommendations about the use of bells and the equipment they should contain. This is a direct result of the circumstances surrounding the deaths of saturation divers Gerard Prangly and Lothar Ward in November 1978 (see *OE* December 1978).

The men were killed when their mother ship was blown off station in the Beryl oilfield 300km north-east of Aberdeen and the umbilical and main lifting cable of their diving bell were sheared by an underwater anchor chain, sending it 110 metres to the seabed.

Three days of evidence at a fatal accident inquiry in Aberdeen last month uncovered several factors which combined to produce the tragedy.

On the final day of the inquiry Sheriff William Murdoch said that the single most crucial factor appeared to be the absence of a 'pinger' from the bell. The sonar device had been removed because it was affecting the mother ship's computer controls. Without it a submersible took more than 3hrs to locate the bell on the seabed.

Sheriff Murdoch also criticised the emergency procedures of the Aberdeen's Star Offshore Services' *Star Canopus* dive controllers, which did not seem to cover the situation that faced them. It was only by chance that a submersible was available and that another diving support vessel was in the vicinity; otherwise, nothing could have been done to try to rescue the men, who were employed by Northern Divers.

The master of *Star Canopus*, Captain Roy Forsyth, was said to have made 'an error of judgment' in not terminating the dive earlier in worsening weather, as predicted in the forecast. It was also stated that a back-up anchor should have been used to supplement the computer-controlled dynamic positioning system, especially as the ship was working in such close proximity to Mobil's Beryl Alpha platform.

What actually happened was that a sudden strong wind overpowered the dp system and the ship was thrown against the concrete legs of the platform. Immediately the divers below were recalled from their work connecting up a 6in dia flow line from a satellite wellhead and their bell started to be winched in.

When they were only 30m from the surface Captain Forsyth was forced to go astern to avoid a collision with the semi-submersible *Haakon Magnus* and as he did so the ship passed directly over one of the anchor cables.

With the bell on the bottom a lock-out submersible from *Intersub* began a systematic search ending in success four hours after the accident. The diving support ship *Tender Carrier* then lowered her bell with two rescue divers. Difficulties were encountered with communications and the hot water supply to the rescue bell and precious hours were wasted although at this time 'through water' communications had been established and it was known that the trapped divers were still alive.

By this time, some eight hours after the accident, hypothermia must have been beginning to set in. The divers' voices on the through-water link were becoming more and more incomprehensible.

They were denied a 'last resort' means of escape by free ascent. This would have meant releasing weights secured to the bell and automatically rising to the surface. But secondary locking pins holding the weights were situated outside and the doorway of the bell was sunk 300mm into the mud.

The locking pins were a recommendation of the Department of Energy after two accidents in previous years when weights had been released accidentally and bells had shot to the surface either killing or seriously injuring the divers in them. Sheriff Murdoch commented that it seemed to him to be only common sense that there should be some kind of internal release mechanism.

Eventually the bell was lifted and as it moved upward Prangly floated out and rose to the surface. At this point Ward was unconscious, but alive. The rescue divers achieved what they believed was a seal on the door and it was taken up.

On the surface the seal was found to be broken and later examination found an exhaust release valve open, making it impossible to achieve a seal. Both divers, it is said, would have died from decompression anyway.

The inquiry was told that the divers themselves must have opened the valve in trying to open the door, either because they thought rescue was imminent or because they had lost control of their faculties.

From the moment the bell plunged downward till its recovery, 14 hours

Research submersible

A highly manoeuvrable craft for seabed exploration and research has recently passed trial tests, following joint development by Nippon Kokan (N.K.K.) and the Japan Marine Machinery Development Association.

The craft, *Tankai*, is 3m dia. with a height and breadth of 2.92m. Its transparent, double-wall, acrylic resin lower hull affords 360 deg vision for the two-man crew. It is connected to the mother vessel by umbilical lines supplying power.

Propulsion and manoeuvrability is controlled by the manipulation of nine water jet nozzles. Maximum propulsion speed is 1·5 knots and operating depth is 200m. JUNE. 1979.

Underwater vehicle

This new Norwegian cable-fed underwater vehicle, called CheckMate, is designed for two persons in a one-atmosphere chamber and certified for operations down to 300 m.

The spherical chamber is made of glass-clear acrylic plastic to provide maximum view. In an emergency the diving bell can be released from the rest of the vessel and will float to the surface, always with atmospheric pressure inside.

A multi-function manipulator is operated from the chamber by a master arm, enabling tasks such as grinding, bolting, taking samples, fixing clamps etc. to be carried out without divers. The manipulator consists of a work arm and the necessary electronic and hydraulic equipment. It can lift up to 100 kg. Underwater T.V. may be attached to the vehicle or to the manipulator. Holding manipulators can fasten the craft to underwater structures.

The very manoeuvrable craft has a radius of 100 m and sufficient power for long-duration underwater work.

Propulsion is electro-hydraulic with three horizontally-acting thrusters and three vertically-acting thrusters. Propulsion control is by electrically-operated servo-valves operated by two joysticks. The vehicle is stabilized in depth by a pressure loop and in heading by a rate gyroloop.

For buoyancy, the vehicle has a droppable solid ballast system to compensate for equipment alternations and an air-operated variable ballast system of 200 litres.

Navigation and communication equipment is provided.

A/S Møllerodden, P.O. Box 212, N-5501 Haugesund, Norway. Telex: 40094.

INTERSUB.

Submersible operators in general may have suffered mixed fortunes over the past year but those which find themselves best situated to face 1980 are the ones which can point to substantial investment in R&D programmes.

One such is the Marseille-based company, Intersub, and its plans for the coming year indicate technical ambitions at which this branch of the industry is aiming, in respect of both manned and unmanned submersibles.

Briefly summarised, Intersub's attention in 1980 will focus on:

☐ safe, comfortable and long diver lock-outs;

☐ advances in platform and riser inspection;

☐ improved pipeline survey;

☐ deeper and longer intervention capability.

Since several accidents have shown that diving from a bell can be jeopardised by a drive-off of a dp. support vessel or by umbilical problems, Intersub sees the lock-out as the safer, autonomous method of intervention. In order to increase the bottom time of lock-out operations, the company is now using two particular pieces of equipment:

☐ a diver heating system, which extracts heat from an accumulator containing melted salt, providing energy for up to six hours, without any significant consumption of the submersible's electrical power;

☐ a lock-out breathing system (LBS), which is a closed-circuit system with all electronic controls inside the submersible. This frees the diver to carry out tasks without any pre-occupation with his gases. This system has been successfully presented to Lloyd's and the Norwegian Underwater Institute and is said to to be light, safe and reliable, saving as much as 90 per cent of the consumed gases.

Consequently a diver lock-out of up to six hours will be possible with full battery capacity available to drive powerful tools.

The heating system and the lock-out breathing system are both available for sale or rental.

Methods of inspecting steel or concrete platforms and risers have not proved totally satisfactory: magnetic particle inspection is slow and will detect cracks only if they have reached the surface of the weld. Riser production has to be interrupted in order to monitor the possible presence of pitting; and as far as concrete platforms are concerned, no system capable of detecting cracks in concrete has been available, even if the stage has been reached where the reinforcement bars are under a process of corrosion.

For several years, Intersub has been researching the application of the acoustical holography principle to detection of cracks or pitting in steel. The resulting equipment is now operational and is said to be able to detect cracks or internal pitting as small as a few millimetres long or deep.

For monitoring cracks in concrete walls, the company is using a corrosion current detector which, it claims, will detect any crack leading to corrosion of a reinforcement bar. Simultaneously, an accurate, doppler-based system is used to position the vehicle on the surface of the concrete wall in an effort to guarantee that the survey of the platform leaves no flaw undetected.

Having developed and used a wide range of equipment for pipeline surveys over the past two years, Intersub has extended its application to use from an unmanned vehicle. The new system, installed on a TROV vehicle supported by the dp vessel *Intersub Five*, offers a fast and more economical survey: 15 to 20km per day of survey, fully documented in real time, being the claim. Exact position of the line, depth of burial, shape of trench (if any), cathodic protection currents and potential monitoring is said to be possible, in addition to high definition black and white or colour video.

The *Pisces V* submersible, entirely refurbished, is now operational and has a 6,600ft capability. This submersible has just joined Intersub's fleet of ten manned and one unmanned vehicles. Three of these can now operate to 3,000ft, particularly relevant in the present trans-Mediterranean pipelaying operations (maximum depth 1,800ft).

In order to meet the demand for round-the-clock operations, three of Intersub's support vessels can operate two submersibles, in a back-to-back mode. Continuous operations of more than 50 hours on the bottom have been undertaken, during pipelaying support, both in the North and Mediterranean seas.

Unmanned Navy Submersible Vehicle Lost Off Hawaii Island

The Navy has lost a $20 million unmanned, experimental submersible vehicle in about 15,000 feet of water off the island of Hawaii, according to a spokeswoman for the Naval Ocean Systems Center.

The RUWS (Remote Unmanned Work System) was lost during a series of experiments on Monday, according to Pat Polakowski.

The experimental vehicle, measuring 11 feet by 4½ feet and weighing 5,000 pounds, was built at a cost of $20 million in 1972. It was not known yesterday whether the Navy will be able to recover the work platform.

A Navy employee who asked not to be identified said the RUWS was lost when a cable linking the submersible and the mother ship broke. He said the cable had snapped earlier during shallow water tests, and precautionary steps were not taken.

Polakowski said the only information available from the Ocean Systems Center station at Kaneohe Bay on Oahu Island was that the RUWS was lost. She said it was not known to her last night how the RUWS was lost.

The RUWS completed its first series of tests in January 1973. It was designed to operate at depths up to 20,000 feet, giving the Navy a platform capable of recovery, survey, documentation and research on nearly 98 percent of the world's ocean floor.

It was outfitted with a high-accuracy deep-ocean navigation system, advanced search sonar, a head-coupled television system and an advanced outside manipulator.

The control center, navigation center and cable-handling system were located on the support ship and were not lost.

The 4.2-mile tether cable was considered a technological breakthrough. It was constructed of a synthetic material judged stronger than steel. It weighed 16,400 pounds. Equipment aboard the RUWS when it completed its first tests included a television camera, sonar, underwater lights and a 35mm camera, all handled by a remote control operator aboard the mother ship.

RUWS was designed to permit the operator to see at the ocean's bottom through a television camera designed to follow the motion of the operator's helmet. The RUWS' manipulators become the operator's arms and hands in the ocean depths.

By viewing a television screen and moving the manipulator arms, the operator is able to extend his or her senses miles below.

The helmet-coupled television viewing system freed the operator's hands to use the seven-function manipulator arms to handle tasks like operating a drill, cable cutters or an auxiliary lift capable of hoisting 200 pounds.

RUWS was introduced following the loss of a hydrogen bomb that accidentally fell into 2,500 feet of water off Palomares, Spain, in 1966. A Navy spokesman said RUWS "gives us a quick response for urgent recovery needs such as occurred with the loss of the hydrogen bomb."

Alvin Makes Thousandth Dive

The Woods Hole Oceanographic Institution's (WHOI) Deep Submergence Research Vessel *Alvin* made its 1,000th dive on January 15th, which was also WHOI's 50th birthday. Those on the dive included Chief Pilot Ralph Hollis, crew chief George Broderson and NOAA geologist Alexander Malahoff. The dive was one of several for Malahoff's studies of volcanic processes at the intersection of the Ecuador Rift and two fracture zones, just north of the equator in the Pacific Ocean.

Alvin was constructed in 1964 under a U.S. Navy contract by the Electronics Division of General Mills (later the Applied Sciences Division of Litton Industries). The vessel has been repeatedly and extensively modified. With the initial steel personnel sphere, *Alvin* could dive to 1,830 meters. A titanium sphere installed in 1973 increased depth capacity to 4,000 m.

Alvin's early years were funded by the Navy, which owns the sub and sometimes employs *Alvin* for inspection of underwater structures. Beginning in 1974, the National Science Foundation and NOAA agreed to share funding with the Navy. *Alvin's* 1979 operating budget totalled $1,829,000. WHOI maintains a 25-member support group.

Raising Sub Studied

The Navy is studying ways to raise an unmanned research submarine that sank Jan. 20 in 15,000 feet of water off Hawaii, the Naval Ocean Systems Center on Point Loma said yesterday.

Although it did not specify what procedures it was considering, one possibility may be to deploy the manned submarine Trieste, which is part of the search-and-recovery Submarine Development Group 1. Cmdr. B.G. Rees of the San Diego-based unit said the Trieste, which is equipped with an outside arm for retrieval, is certified to dive to 16,500 feet, but pointed out that his command has not been requested to raise the sunken craft.

The craft, whose replacement cost was estimated at $750,000, sank during a test dive when a cable linking it to its mother ship snapped. The cable was recovered intact, which would aid recovery attempts, according to Pat Polakowski of NOSC.

Unmanned Submersibles Grow; Manned Submersibles Slow

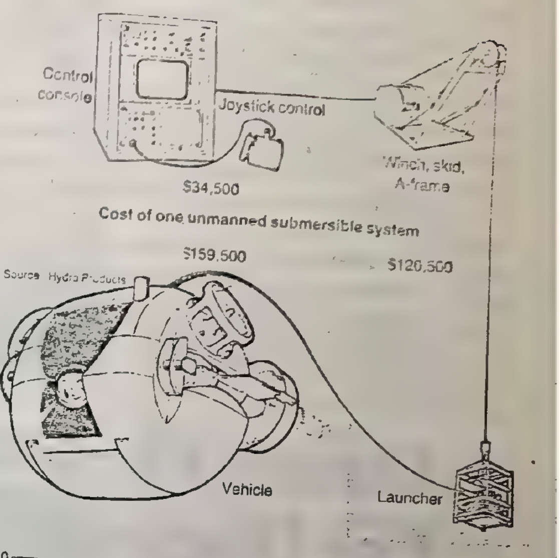
The worldwide fleet of submersibles continues to grow, but the major growth in construction is for unmanned submersibles. The market for manned submersibles is depressed, although two major offshore operations will require these units in the future.

For the manned submersibles, monitoring of deepwater drilling operations and pipelaying will provide some lift. Lack of platform construction in the North Sea has caused a severe depression in the market in that area. Several companies have had to re-organize and shift emphasis on submersible operations.

Unmanned submersibles, however, are being used in more and more operations previously done by divers and manned submersibles. The stringent safety requirements in the North Sea bring the use of unmanned submersibles to high levels for inspection and light maintenance work.

The one bright area for a particular type of manned submersible is in the one-man atmospheric diving suit, which is being recognized more throughout the offshore industry for its capability of putting a man on the seabed where he can work and be in contact with the job underway.

Submersibles	In Service	Under Construction	Planned
Unmanned	97	8	10
Manned	148	1	0
Total	245	9	10



Cost of one unmanned submersible system

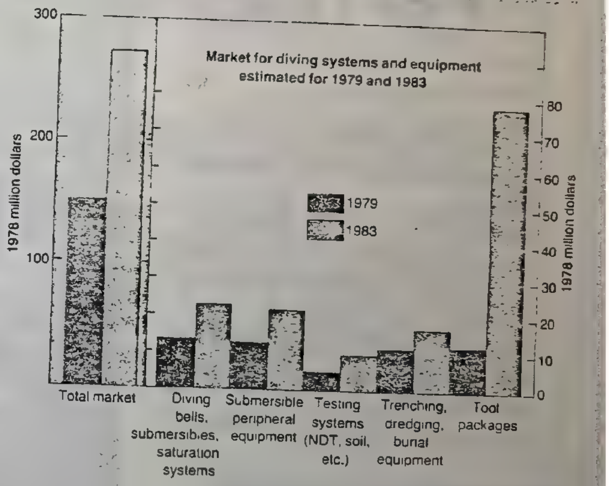
Underwater Maintenance and Inspection

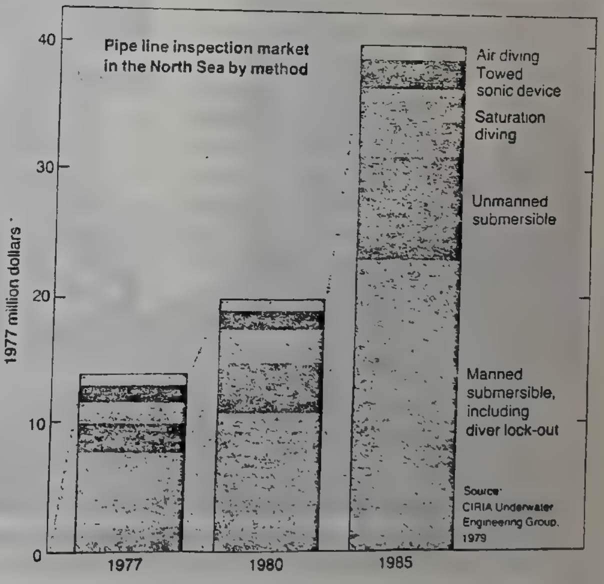
One of the hardest markets to predict concerns underwater inspection and maintenance. This market is affected by platform construction, governmental requirements and the type of environment the offshore installations are in.

By far the toughest governmental regulations are encountered in the North Sea where regular inspection and maintenance are required by both Norway and the United Kingdom. This is a direct result of the hostile environment of the North Sea. The types of platforms and construction procedures used in the Gulf of Mexico have undergone drastic change as operational experience in the North Sea has increased the working knowledge of installation designs for the sea.

Diving operations continue to take the biggest share of the market at the shallower depths. With the use of saturation diving, though, the costs force many operators to look at alternate methods for inspection and light maintenance.

The use of the one-atmosphere, one-man diving suits is being more widely accepted in the industry and installation designers are taking this into consideration in developing new systems. Accessibility of inspection equipment to the interior of platform jackets is also a major concern.





Source: CIRIA Underwater Engineering Group, 1979

4/80

People and Places

President Carter appointed in November five new members to the **National Advisory Committee on Oceans and Atmosphere (NACOA).** Of these new NACOA members four are also MTS members and are: **Michael R. Naess,** President of Westerminster Ventures, Inc.; **Jack R. Van Lopik,** Dean of Louisiana State University's Center for Wetland Resources and a professor of Marine Sciences; **Don Walsh,** Director of the University of Southern California's Institute for Marine and Coastal Studies, MTS Journal Editor and MTS Council member; and **Robert M. White,** Administrator of the National Research Council. Also appointed at this time was **James M. Waddell, Jr.** of Beaufort, South Carolina, a state senator and chairman of the South Carolina Coastal Council. NACOA's primary directives are to carry on a continual review of U.S. ocean and atmospheric programs, to review and report on NOAA's activities, and to advise the President and Congress, on an annual basis, as to the status of the nation's marine and atmospheric development.

Three MTS members visited Japan for the Marine Facilities Panel of the U.S.-Japan Natural Resources Committee in late October. Participating in these meetings in Tokyo were **Joseph R. Vadus,** MTS Vice President for Technical Affairs, **William Nicholson,** Chairman of the Marine Facilities Panel, and **John Pritzlaff,** Chairman for the MTS Subcommittee on Submersible Safety Standards. The topics discussed were ROVs, submersible safety, seafloor engineering, and ocean energy. After the meeting the three MTS representatives traveled in Japan to examine the latest developments in technology, particularly offshore facilities.

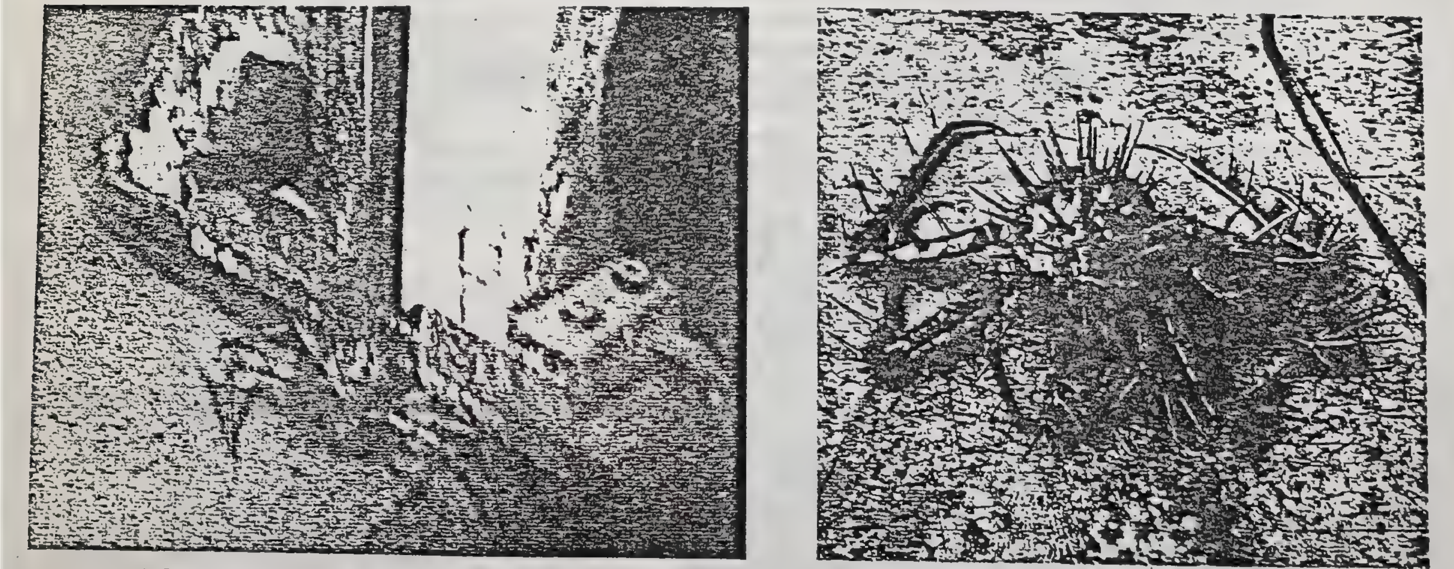
Pisces VI—Deep Eyes and Arms For *Discoverer Seven Seas*

Andre Galerne, President, International Underwater Contractors, Inc.

The drillship, *Discoverer Seven Seas*, in operation for a little less than three years, has established an enviable record, including the drilling of two record water depth offshore wells.

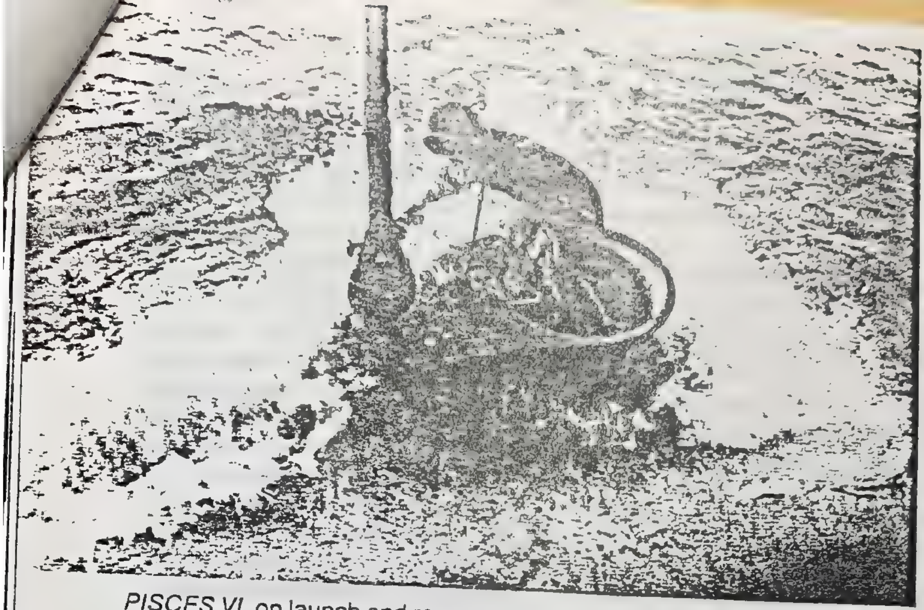
During this short history, mobility and the capacity to get the job done efficiently in extremely deep waters and under otherwise difficult conditions have become the chief characteristics of the rig's operations. Water depth for all drilling sites has ranged from 362 ft off the Ivory Coast for Phillips on the rig's maiden drilling assignment to 4,876 ft off the coast of Newfoundland, where in September the unit drilled the record-setting wildcat Blue H-28, a dry hole drilled for Texaco Canada, operator, and four other companies under a farm-in agreement with Shell Canada Resources and Shell Explorer Ltd.

The *Discoverer* is the only offshore rig to perform commercial drilling in water depths below 4,500 ft. The operator, The Offshore Co., has learned much from their experience and made several adjustments in procedures and equipment. One such adjustment came from the realization that many advantages were to be gained from a change

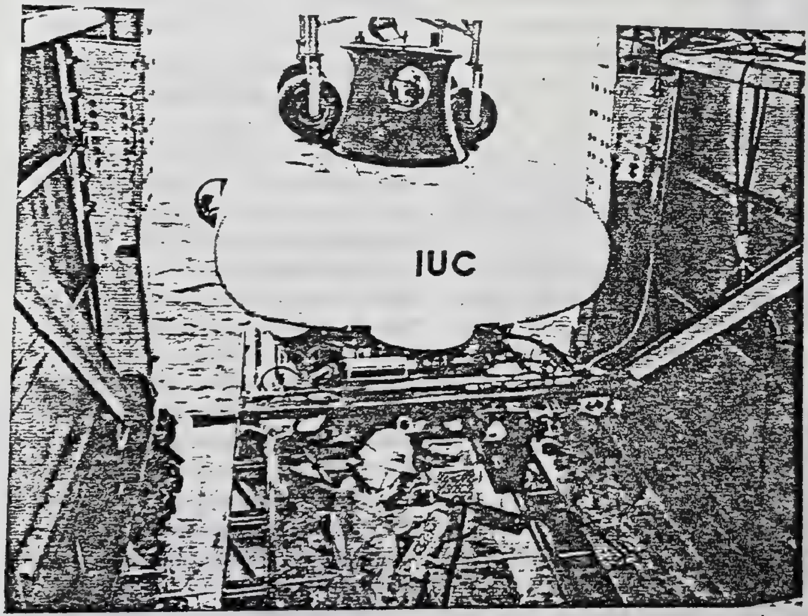


A RARE *Heolithodes Grimaldii* crab photographed (left) at corner of BOP stack at Blue H-28 wildcat was picked up by sub's manipulator, placed into exterior basket and taken to surface uninjured.

4/80



PISCES VI, on launch and recovery system, entering water.



SUBMERSIBLE ON SKID SYSTEM being recovered through hydraulically opened hangar doors.

in diving modes after the drilling off Egypt in 1977. Those wells, in 1,838 and 2,060-ft water depths, were drilled with the use of a tethered bell serving as the diving component.

Then came the Pointe Noire, Congo, project and a quantum leap down to 4,346 ft. The bell system used heretofore could not operate at that depth. Either a new deeper diving bell system had to be fabricated at high expense and broken-in with minimal or no experience, or other options had to be explored. There could be a return to total reliance on sonar and remote control TV—and no manned presence on the bottom—or there could be an investigation of manned untethered submersibles.

Enter *Pisces VI*. This was the stage of development of the *Discoverer Seven Seas* diving component in December 1977. At that time, via a contract with Getty Oil, coordinator of the consortium contracting the drillship, the deep submersible, *Pisces VI*, became part of the operating system. It was a first for both the drillship and the submersible.

The results of the integration have been positive. The addition of *Pisces VI*, to the unit's array of tools has for approximately two years proved to be both productive and harmonious. During this period, *Discoverer* has completed drilling operations at six widely separated sites, three of which were in water depths in excess of 4,000 ft.

Originally built, owned and operated by Hyco Subsea Corp. of Canada, *Pisces VI* was manned for its drillship mission by Hyco pilots and a complement of sub-contracted divers for moonpool work, who also doubled as communicators and observers inside the sub during its dives.

In June of this year, in the middle of the Texaco Canada contract, International Underwater Contractors, Inc., New York City, purchased *Pisces VI* and the remainder of its then current contract from Hyco and completed the submersible work at the offshore Newfoundland site. IUC's most experienced pilot/divers were phased in smoothly to the 28/28 work schedule and nullified the need of a diving personnel subcontract for the moonpool work. In most cases, these men were veterans of many years with IUC both as pilots of the other three vehicles in the company's submarine fleet and also of many phases of underwater construction and repair work on major contracts over the years as open water divers.

Work Assignments. The initial role of *Pisces VI* with *Discoverer Seven Seas* (as was the case with its tethered bell predecessor) was as a back-up system to the independent remote control components more or less standard on deepwater drilling rigs. As time passed and its capabilities became apparent and proven, the vehicle became the primary observation system. It also is expected that *Pisces VI* will be able to conduct emergency salvage of the BOP stack and riser, and any other equipment that may need retrieval from otherwise inaccessible areas underwater.

Entries and Re-entries. There are compelling reasons why *Pisces VI* performance is thought by many to be su-

—11—

4/80

perior to a sonar/TV re-entry system acting alone. The extreme sophistication of dynamic positioning technology is a remarkable achievement and sonar/TV re-entry tooling at all reports has kept pace as well or better than could be expected. Entry and re-entry performances of *Glomar Challenger* in water below 16,000 ft and current plans that are now projected for commissioning *Glomar Explorer* "as the world's most powerful drilling platform" complete with BOP stacks and other standard deep well drilling capabilities assure that dramatic results are possible in this crucial phase of operations without a manned presence on bottom well beyond the range of even a *Pisces VI*. *Sedco 472*, off South America in 3,000 ft of water and strong current, also relies on a sonar/TV system without submersibles. Yet, while comparative statistics are not available, there is broad agreement that a manned presence is generally more efficient than total reliance on remote control TV and sonar as the source of imagery and communication for two reasons. First, manned submersibles bring the naked eye within a few feet of operations and reduce the amount of visual distortion.

Second, a free-swimming submarine can maneuver itself to the very best viewpoint for observing the relative positions of the guidebase, drillstring and stack. Verbal communication to the surface via underwater telephone directs the movement of drillstring or stack to complete the stabbing. Speed of entries and re-entries, of course, vary with differing conditions on the surface and with midwater currents. A review of some of *Pisces VI* dive logs from drilling operations reveal stabbing times ranging from 8 to 40 minutes, with a 22-minute average.

But the advantages of a manned, free-swimming submersible in support of deepwater drilling are not confined to its role during entry and re-entry maneuvers. *Pisces VI* has performed numerous other support tasks that could not be done without such a vehicle. And there is a potential for a great many more, not the least of which could be its role during conditions of emergency.

General Inspections. *Pisces VI* is capable of inspections more wide-ranging than those provided by sonar/TV or a tethered submersible. Included in this category of work are guide base and stack inspection, riser inspection and bottom surveys.

During requested examination of the guide base, details as to its depth of penetration into the mudline and overall condition are reported. During casing operations, surface personnel can be alerted to any cement returns or gas leaks. The BOP stack is periodically inspected, especially with reference to the level indicator. Besides being able to maneuver to the best possible vantage point in any of these inspectional tasks, *Pisces VI* also can improve its observation by removing any obstructing silt or mud deposits through use of its jet pump.

Top-to-bottom riser inspection is another *Pisces VI* task, with special attention paid to air leaks that may develop at riser section flanges and float valve positions. The position and overall condition of the control cables also is noted. In all inspection work, when deemed necessary, videotape recordings are provided for review by surface personnel.

Occasionally, bottom surveys are requested of *Pisces VI*, as in the Congo when a detailed bottom contour report was made in the wellhead area to a radius of 1,600 ft, or the limits of the submarine sonar range. Elevations and general bottom conditions are reported and can be videotaped.

Work With Manipulators. *Pisces VI* has two manipulators: a heavy duty claw and a general purpose arm with seven independent movements. The claw has a 28-in. grip and a 2,000-lb lift capacity; the general purpose arm, a 7-in. grip and a 150-lb lift. There also is a remote-controlled cargo hook by which the submarine can exert a 500-lb line pull on the drillstring to aid in stabbing operations or other maneuvers where such a force is useful.

After entry or re-entry of the guide base and BOP stack, there are many tasks in relation to acoustical beacons that *Pisces VI* routinely performs with its manipulator arms. Among these are the placement and replacement of beacon caps and, on one occasion, the change-out of a complete beacon. In this type of operation, special drop weights are required to adjust for the weight of the object to be worked on. The normal *Pisces VI* payload of 800 lb can be increased by carrying jettisonable weights released upon securing whatever item is to be returned to the surface. The manipulators are essential in any retrieval operations, which can involve either small or large objects. One of the smaller retrievals completed was 20-in. casing slips lost through the moonpool, located via the scanning sonar. Another, from the bottom off Newfoundland at 4,876 ft at the base of the wellhead, was the gathering of a delicate spiny crab later sent intact to the Canadian government's Department of Fisheries and Oceans. It proved to be a rare specimen of *Heolithodes Grimaldii*.

Safety. There have been no serious mishaps with the *Discoverer* either before or after the integration of *Pisces VI*, and it is in the realm of safety that the submarine may ultimately be of most value to the offshore industry. Adapted to carry a hydraulic accumulator for last resort disconnect of the BOP stack, *Pisces VI* can plug the device into the stack with its manipulator, then control it from inside the submersible. It would take the failure of both the blue and yellow pods and the acoustic release system for such a maneuver to be necessary, but with oil spill headlines in today's newspapers, there is no need to detail here the importance of a BOP safety backup system that is as comprehensive as possible.

There is another compelling point to be made concerning safety. At least as important as the threat of blowouts and hazards to life associated with that form of offshore accident is the threat to diving personnel posed by the vulnerability of tethered bells. The inexorable fact that the deeper the diving operations, the greater the danger to divers is even more dramatically acute when the depth begins to be measured in thousands of feet.

One of the strongest arguments for the use of free-swimming submersibles in extremely deep water is that they eliminate the danger of tether/umbilical

Continued

4/80

entanglement or severing that has resulted in numerous diver fatalities and near misses on dynamically positioned drillships.

The Future. Other potential work that *Pisces VI* most certainly can perform when the need arises includes the placement of explosive charges in the removal of guide bases or other bottom obsolescences, and also the change-out of BOP stack connectors seal rings.

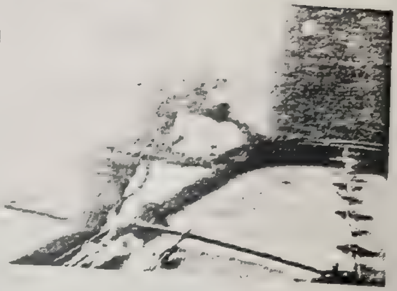
A direct-line, closed-circuit TV capability is now being considered that would require a coaxial cable incorporated into the down line guide wire with a plug-in component at the bottom. Live TV bottom coverage then would be routinely available simply by plugging in the *Pisces VI* equipment.

As Sedco, Inc., representatives have pointed out (*Ocean Industry*, June 1979):

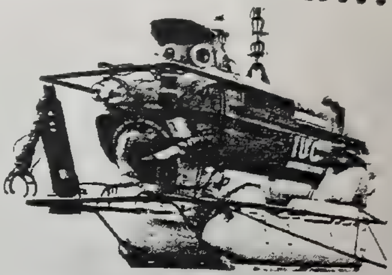
> *Deepwater drilling is basically an unexplored area of needed technology. Almost every location brings its own special requirements which have to be met and usually result in a "first" in the industry. Flexibility and the proper technical pre-planning, in most circumstances, will provide for the special deepwater techniques being developed as an art today to become a science in the future.*

As the drilling industry's first application of an untethered manned submersible in support of deepwater drilling operations, *Pisces VI* probably will not be the last. Its future (and presumably the future of many other subs) appears to be linked dramatically to the offshore industry. Its HY100 steel spheres will not crush under pressure of less than 10,000 ft of seawater. Working as it is today at roughly half that depth in support of *Discoverer Seven Seas*, the full extent of its work potential is far from realized. Between the surface and its 8,300-ft depth limit, it can certainly do a wide variety of work that it has not yet performed, some of which, perhaps even the most advanced technology, has not yet been envisioned. ✔

The diver...



the mermaid...



and the underwater camera.

They each have their place.

Our MERMAID II submersible can carry a half ton of men and equipment to a 1,000-foot depth on a broad range of assignments. Other jobs are handled safely and economically by IUC diving teams using their long experience in saturation and bounce diving. For inspection and observational work to 1,200-feet, IUC's remote controlled Tethered Underwater Survey System (TUSS) is available with CCTV on pan and tilt plus manipulator. The 30-day, 6,000 mile range of IUC's support vessel *Aloha* places these undersea capabilities on your job wherever your operation. Learn about them "in depth" by writing or telephoning today.

IUC
IUC International Inc:
P. O. Box 279
Hamilton 5, Bermuda

OPPORTUNITIES AND USES OF THE OCEAN

DAVID A. ROSS
Woods Hole Oceanographic Institution

Covering 72% of our planet, the oceans have captivated and challenged people for centuries. Modern technology has opened new opportunities to use these great bodies of water and their resources.

Exploring the present and future potential of the world's oceans, OPPORTUNITIES AND USES OF THE OCEAN focuses on problems that can be solved by applying current scientific and technological capabilities. Following a concise introduction to oceanography, the author discusses the legal aspects of ocean use, marine shipping, military usage, and coastal zone divisions. Also, an in-depth examination of ocean pollution and resources is presented.

OPPORTUNITIES AND USES OF THE OCEAN offers fascinating and invaluable information to anyone concerned with ocean use and marine policy.

Contents

The Opportunity of the Ocean
How the Ocean Works
The Legal Aspects of the Ocean
Marine Shipping
Resources of the Ocean
Pollution of the Ocean
Military Uses of the Ocean
Coastal Zone Divisions, etc.
Innovative Uses of the Ocean
References

1979/320 pp./144 illus./cloth $19.80

The U.S.S.R. Submersible *Academic*: Buying the Best in Undersea Technology?

By Jon B. Jolly

On 30 May 1979, V/O "Sudoimport," the purchasing agency for the Soviet Union for auxiliary ships, on behalf of the P.P. Shirshov Institute of Oceanology, U.S.S.R. Academy of Sciences, placed a $20 million order with Canadian Underwater Vehicles Ltd. (CUV Ltd.) in Vancouver, British Columbia, for a research submarine which can operate at depths of 6,000 meters (approximately 20,000 feet). This submersible, designed for a crew of three, is to be powered by hydrazine, using a closed turbine system. The hydrazine propulsion technology development is to be supported directly by Soviet technicians. In addition, the Soviet Union is to furnish the personnel sphere directly from the fabrication facilities of a Swiss company. CUV Ltd. has ordered an extra sphere in the event others outside the U.S.S.R. may wish to acquire such a research vehicle.

The task of testing the spheres will be handled also by the Swiss company which, as a part of the contract, will produce the required test facility. Presumably a test facility would be installed permanently in the Soviet Union. Now it appears that the only facility capable of such testing to the required 7,200-meter depth is the David Taylor Model Basin in the United States.

The characteristics of the submersible *Academic* (formerly *Sturgeon*) are as follows:

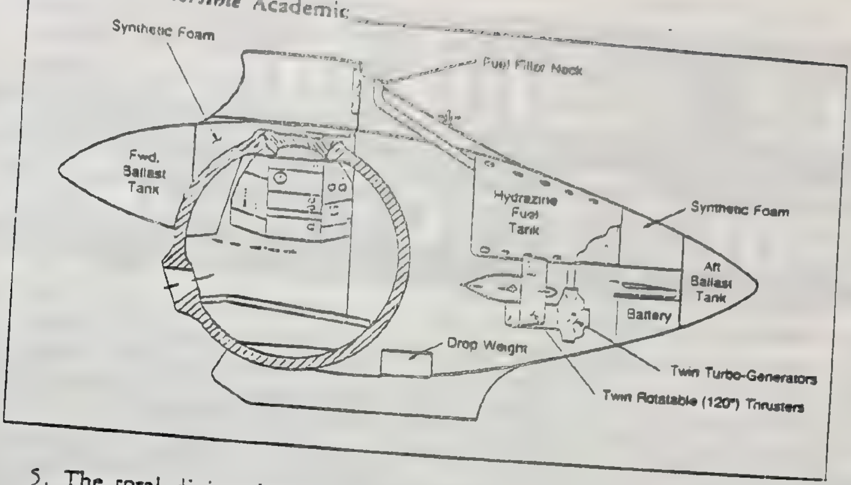
1. The submersible is to be in strict conformity with the rules and regulations of the American Bureau of Shipping (ABS).

2. The general performance data include the following: 20-foot overall length, 10-foot beam (with extreme over thrusters, and less than 8 feet with thrusters removed), 10-foot height (less than 8 feet with sail removed), approximately 16,000-pound unfueled weight in the air, 6,000-meter operational depth, 5-knot guaranteed speed (with an 8-knot goal), 216-man-hour life-support system (which can be increased), and 2 turbine generators making 100 KWh power available with 550 gallons of hydrazine.

3. Delivery is to be effected 26 months after the contract is in force. (The contract is dependent on obtaining an export license, which is required by current NATO agreements with the Canadian Government.)

4. The stability of the submersible shall be in full conformity with the requirements of the ABS.

U.S.S.R. Submersible Academic



5. The total diving depth capacity shall not be less than 6,000 meters, based upon the successful completion of the 7,200-meter simulated test of the spheres.

6. The speed shall be up to 5 knots for a period of not less than 90 minutes.

7. The payload shall be not less than 840 pounds from the surface, and the submersible shall be capable of picking up 1,500 pounds from the bottom.

The instrumentation suite for the submersible is a completely detailed and up-to-date set of underwater equipment to carry out a wide spectrum of research tasks. While there may be difficulty in obtaining a few export licenses on the equipment, the majority is exportable to Eastern Bloc nations without delay under current Department of Commerce, Department of Defense, and Allied Control Commission regulations. Where it is not possible, the contract provides that appropriate substitutions may be made. Actually the *Academic*'s instrumentation suite, as presently contracted for, is quite similar to the "package" on the research submersible *Alvin*, which is operated by the Woods Hole Oceanographic Institute for the Office of Naval Research. The Soviet submersible will carry a sophisticated stereo camera, a complete television system, the latest in turbulence-sensing equipment, and a reasonably sophisticated data collection and storage system.

One of the more interesting features of the contract is the inclusion of three tethered, remotely controlled, unmanned vehicles, also rated for operating depths of 20,000 feet. These vehicles are to provide further emergency support. It is planned to put one in the Atlantic Ocean, one in the Pacific, and the third in standby. At the present time, it is not known whether a special vessel will be built to accommodate the *Academic*, or if she will be used with existing research vessel platforms. Clearly, a quantum jump in technology will be required to assure the success of these unmanned vehicles at such great depths.

Mack Thomson, founder of CUV Ltd., was the design manager for *Pisces*-class submarines, which were built by International Hydrodynamics Ltd. (HYCO)—now in receivership and virtually liquidated—in North Vancouver, British Columbia. This company, of which he was also a founder, under the leadership of Don Sorté (now deceased), was the first major company outside the United States to produce more than one or two submarines capable of deep operations. HYCO, using Mr. Thomson's designs, built approximately 15 *Pisces*-class boats, as well as several other "lock-out" type boats. The U.S.S.R. Academy of Sciences, Institute of Oceanology, has two of Mr. Thomson's submarines in operation now, the *Pisces VI* and *Pisces X*. The former is operating in the Atlantic from the *Akademik Kurchatov*, and the *Pisces X* is in the Pacific operating from the *Dmitri Mendelev*. Deep submergence tests to 1,760 meters were completed late in 1978 without incident off eastern Australia by the *Pisces X* under the scientific direction of Dr. Anatoly Segalevitch, who made the dive. It is reported that the scientists of the U.S.S.R. Institute of Oceanology have been extremely pleased with the performance of the *Pisces*-class boats, and it has been this satisfaction that has led to the award of this new contract.

CUV Ltd. has taken over the HYCO facilities in North Vancouver, B.C., including a long-term lease on the buildings, and all hardware assets, including milling machines, lathes, molds, patterns, blueprints, and the like. CUV Ltd. is presently negotiating to complete several substantial contracts which were unfulfilled by the now defunct HYCO. One of these is an unmanned target recovery vehicle for NASA in Houston.

The hydrazine power plant design team, including Soviet technicians, will be directed by Dr. Ed Hauptman, a heat mechanics specialist at the University of British Columbia, Department of Mechanical Engineering. He has been associated with Mr. Thomson for several years. The chief mechanical designer and stress engineer is Warren Jocelyn.

It is clear that the Institute of Oceanology, Academy of Sciences U.S.S.R., is on the verge of taking a significant step forward in deep submersible design through the technology expansion planned for this submersible contract. According to Mr. Thomson, the U. S. Navy has been invited to participate in this challenging endeavor by commencing negotiations with CUV Ltd. toward ordering such a craft. Thus far, the Navy seems to have adopted a wait-and-sea attitude. By ordering the extra personnel sphere, CUV Ltd. is prepared to build another such submarine for anyone who wants it and is willing to meet the price. As the U.S.S.R. is furnishing its own sphere, it may be anticipated that a complete price for such a project could run to the order of $30 million.

There is no avoiding the political and military implications of such technology. Neither can the Canadian Government take a cavalier attitude toward this major extension of undersea industry in British Columbia. Mr.

Thomson says that he will be disappointed if Ottawa fails to support this major job and prestige-generating project by promptly issuing the requisite export license. However, he makes it plain that the deep-diving *Academic* will be built, and by CUV Ltd.—even if he has to move his operation to Switzerland, outside of NATO jurisdiction. The contract has been drawn in such a way as to admit this possibility.

Historically there has been much breast beating in the Department of Defense around budget review times over how the Soviets are catching and even passing the United States in critical areas of technology and, by extension, defense posture. In reality, the U.S.S.R. simply has failed to keep up with the leader—the United States—in the parade of technical progress. When the *Academic* is complete and tested, submersible technology will be an area in which the Soviets will be clearly ahead. It behooves the U. S. naval defense establishment to take a careful look at this emerging deep submersible technology.

Interestingly, senior Soviet scientists who are responsible for this project have affirmed their willingness to supply this hull for possible use with the extra personnel sphere if operated by the United States.

Perry Oceanographics, Inc. Offers Services And Products Brochures

Perry Oceanographics, Inc. has recently published a series of single-page brochures describing engineering services and products offered by the firm.

Perry has long been recognized as a leader in the design and fabrication of submersibles and dive systems. Perry is now offering shipyard support services, including interface engineering to incorporate submersibles or dive systems onto surface support ships; general naval architectural and marine engineering calculations; and contract plan and specification preparation.

The product brochures describe available engineering services and provide specifications on submersibles, dive systems, remote control vehicles, manipulator arms, and thrusters.

For free copies of these brochures, write **Mrs. Rita Pellen,** Perry Oceanographics, Inc., P.O. Box 10297, Riviera Beach, Fla. 33404.

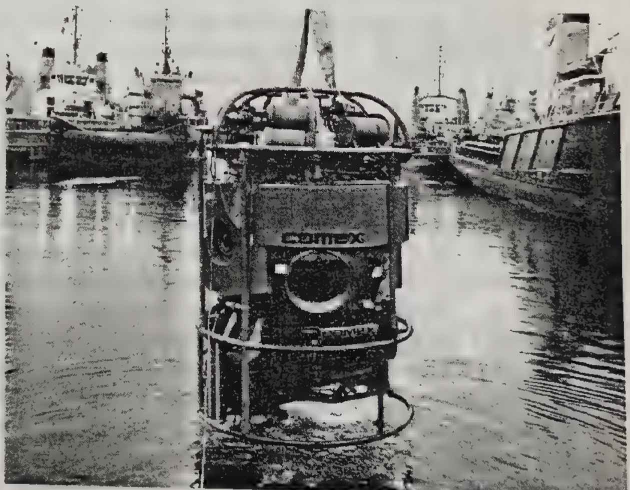
Personnel Marker Lights Approved By USCG

The Cyalume PML personnel marker light, developed by American Cyanamid Company, has been approved by the U.S. Coast Guard ruling (161.012/2/0) for use on all regulation life vests and personnel flotation devices on commercial vessels.

The chemical light system called "chemiluminescence" is produced by activating the PML, which causes two nontoxic chemicals within to mix together, producing a safe, cool, yellow-green glow visible for at least one mile on clear, dark nights. The glow lasts at least eight hours. The PML is windproof, waterproof, lightweight, requires no batteries or electricity. Cyalume PML personnel marker lights have a shelf life of five years and carry a 2½-year expiration date.

For further information on the Cyalume PML personnel marker light, write to **Clem W. Kohlman,** American Cyanamid Company, Chemical Light Department, Wayne, N.J. 07470.

Marine Biologist Dr. **Sylvia Earle** has set a new diving record for women. While filming a television special in conjunction with National Geographic Magazine, Dr. Earle dove to a depth 1,250 feet (381 meters) in Oceaneering International's one atmosphere JIM suit. She and her collaborator Al Giddings were at the time preparing a show for a continuing series of man-in-the-sea films for television. During one of her dives, Dr. Earle walked on the bottom for three hours. Dr. Earle is program director for the Ocean Trust Foundation and was recently appointed to the Board of Directors of Underseas Industries, Inc., along with underwater cinematographer **Stanton W. Waterman.**



Comex Diving's MOB 1000 manipulation and observation bell, which has a depth capability of 1,065 meters, was deployed this winter from the multifunction service vessel *Uncle John* in the North Sea. The vessel, managed in a joint venture between Comex and Houlder Offshore, supported Shell operations in the East Shetland Basin.

H-bomb finder to search for Titanic

By RITA ROSS

IN A real-life adventure worthy of a fairy tale, Texas oilman Jack Grimm of Abilene will soon lead an incredible expedition in search of the ill-fated Titanic.

The luxurious ship sank on its maiden voyage in 1912, plunging 1,500 passengers and millions of dollars worth of personal property into a silent, watery grave.

Since that disastrous accident, Titanic fever has struck on both sides of the Atlantic.

ALUMINAUT will take pictures of the inside of the Titanic.

Dozens of treasure hunters have long dreamed of finding the hulk of the gigantic vessel that lies two miles down on the ocean bed.

Grimm, 54, a geologist and president of the Grimm Oil Company, wants to be first to locate the ship's precious remains.

"Nobody knows for sure exactly where the Titanic sank," he told GLOBE. "But this summer our expedition aims to find it."

He and a 37-member crew will ply the North Atlantic in hopes of filming what's left of the vessel.

"We'll use sonar, a system that bounces sound waves off submerged objects, to identify the wreck."

Grimm estimates the project will take at least a year and a half to complete.

"The Titanic should be in a near-perfect state of preservation," he says. "At that depth there's very little oxygen to react with the metal, and no coral life to destroy it, either."

After pinpointing the ship's position, special cameras will be lowered into the murky ocean depths to photograph its outside condition.

"Then we'll use the Aluminaut, the world's largest deep-diving machine, to take pictures of the interior."

The 50-foot-long Aluminaut was last put to work several years ago locating a hydrogen bomb lost off the Spanish coast.

It carries up to ten passengers to depths of 15,000 feet and can stay submerged for three days at a time.

The Aluminaut has two waterproof robot-like arms that will reach into the wreck of the ship and photograph the interior cabins.

"The pictures will be taken with a special process that pieces together an image like a computer, since it will be much too dark down there to take conventional photographs," says Grimm.

"Rumor has it the Titanic was transporting several million dollars worth of diamonds from Europe when it sank," Grimm says. "If this is true, they're probably lying untouched in the purser's safe.

"We're not going to touch or remove anything from inside the ship. Our aim is to photograph the ruins and make a documentary movie of what we find.

"It's eerie that the Titanic is a gigantic burial ground for more than a thousand people. We don't intend to intrude, but to respect the dead by letting them lie in peace."

Many of the items aboard the vessel are historically valuable, he says, including jewelry, personal possessions and ship decorations.

Michael Harris of the International Expeditions Film Company in Florida heads the team of photographers scheduled to unlock the Titanic's watery mysteries.

"We're very excited about the project," he told GLOBE. "There should be lots of important information down there."

Lloyd's Register Classes Two COMEX Lock-Out Submersibles

Lloyd's Register of Shipping (LR) has approved the design and surveyed construction of two lock-out submersibles, SM 358 and SM 360, designed and manufactured by Comex Industries, Marseilles, France, for class as +100A Manned Submersible Craft (with diver lock-out compartment).

The craft combine the advantages of the diving bell with those of the submersible, and are capable of observation and operational dives to water depths of 300m.

Both submersibles have a two-compartment pressure hull with an interconnecting door. The pilot and co-pilot are accommodated in the one-atmosphere forward compartment which has good visibility provided by three viewports. There are also six viewports on the conning tower. The after compartment is designed for 2 divers and their attendant.

Sufficient gas is carried for an operating time of eight hours and power is supplied from batteries with 48 KWH for SM 358 and 160 KWH for SM 360.

The submersibles are fitted with 2 manipulator arms: one for gripping, the other for working with 6 degrees of freedom. These arms may be jettisoned in an emergency. ☐

A/80

FROM OUTER TO INNER SPACE

SWEDLOW, INC. Old Yet New... Solidly-Based Yet Ever Changing

S It is through these seemingly contradictory characteristics that SWEDLOW, INC., has established itself as an industry leader in acrylic casting and design.

Those of you who are familiar with the Swedlow name, probably associate it with aircraft, and you'd be partially correct. For 40 years, Swedlow has continued to maintain its position as a leading supplier of acrylic windows, windshields, and canopies for commercial and military aircraft.

The secret to the Company's success is their acrylic product, *Acrivue*, which has been refined and improved upon since 1938. Swedlow engineers also designed the world's first continuous casting machine, which produced "Swedcast 300" acrylic sheet stock. In 1975, this process was sold to U.S. Steel. Although initial sheet size is limited to 6′ x 12′, Swedlow has the capability to butt bond and laminate layers of acrylic sheets to create any desired length or thickness.

Acrivue has a superior clarity while weighing only half as much as a comparable sheet of glass. And when it has been coated with Swedolw's proprietary abrasion resistant coating — to become *Acrivue A* — its impact strength is twice that of safety glass and repeated rubbing with abrasives like steel wool leaves it unmarred.

Because of its lighter weight and low maintenance, *Acrivue A* is a real energy-saver. Its current uses include: windows for BART; windows for municipal bus lines; airplane windshields and canopies; RV windshields; and vending machine transparencies. "With over three years field service in major metropolitan bus and rail rapid transit systems, *Acrivue A* has shown no apparent change in condition. Its light weight cuts down on fuel consumption and because of its impact strength, replacement of windows broken by vandals has been drastically reduced," said William Gregg, Marketing Manager for Swedlow's Architectural Products Group.

"There's another variation of *Acrivue* called *Acrivue ASG*," Gregg continued. "ASG is an abrasion resistant security glazing that will stop a .38 caliber bullet at point blank range, plus, it's 7 times stronger than safety glass."

In response to society's changing needs, Swedlow has pioneered significant research on the application of acrylic optics in the conversion of solar energy through either photothermal or photovoltaic methods. These include design and fabrication of cast acrylic Fresnel lenses for Westinghouse and Sandia Laboratories.

Their acrylics are also used to create zoos without bars and for modern furniture designed by the "Swedlow Group." Last, but certainly not least, their reinforced fiberglass is used in the U.S. missile program.

INTEREST IN ALL FORMS OF OCEAN LIFE and exploration has markedly increased in recent years, triggering expanded development in two specific areas: marine parks for the public and submersibles for underwater research and observation. Swedlow is here too, and again, in the forefront of acrylic design.

The breathtaking Seattle Aquarium is an excellent example of Swedlow's contribution to the marine sphere. The geodesic dome is constructed of individual panels of *Acrivue;* water clear and distortion free. Inside this underwater dome, the public feels part of the Puget Sound environment. It's as though no barrier existed.

Acrivue is also an integral structural component for: the Sea Life Park in Hawaii; the New York Aquarium in Brooklyn; the University of Hawaii Seaquarium in Honolulu; the Baltimore Aquarium (to become the National Aquarium); the New England Aquarium in Boston; the Mid-America Museum Aquarium in Arkansas; and the Moorehead City, N.C. Dept. of Administration Aquariums. *Acrivue* is effective because, as Bill Gregg says, "it makes your visitors part of the scene."

Two more specialized applications can be found at the Fontainebleau Hotel in Miami, where *Acrivue* forms an aquarium bar; and at Southern California's Marineland, where a Baja reef exhibit is viewed through *Acrivue*. Currently, Swedlow is consulting on the Florida Disney World project and the Monterey Bay Aquarium.

Ocean exploration has also been touched by Swedlow's acrylic design capabilities. Three NEMO spheres were constructed for the Naval Civil Engineering Laboratories. Fabricated from 12 pentagonal sections of 2.5 inch thick actylic, the NEMO spheres measure 66 inches in diameter and are certified to operate at a depth of 600 feet.

From the experience garnered from the NEMO project, Swedlow went on to build the Johnson-Sea-Link pressure capsule for Link Industries. Made of 12 pentagonal sections of 4 inch thick acrylic, the Sea-Link is being used by the Smithsonian Institution for underwater research and was written up in *National Geographic* for its adventures.

"Both the NEMO spheres and the Sea-Link provide a shirtsleeve environment with a panoramic view that offers an ideal observation plaform for underwater photography, marine research, and pipeline/offshore oil drilling rig inspection," explained Bill Yamaguchi, Marketing Manager, Development Projects.

Swedlow is constantly striving to meet the needs of an ever-diversified industrial market, and so far, everything they manufacture improves the existing state-of-the-art considerably.

Tours of Swedlow's facilities can be arranged, given an adequate lead time. So if you'd like to visit their plant in Garden Grove, or you'd just like some further details on their products, you are invited to contact: Mr. William Gregg at (714) 893-7531.

Navy Commemorates Trieste Dive

WASHINGTON—On Jan. 23, 1960, the bathyscaphe Trieste made a record dive to the unprecedented depth of 35,000 feet in the Challenger Deep and conquered the last unexplored region on earth—the deepest part of the ocean.

In commemoration of the 20th anniversary of this historic dive, the Navy held a ceremony in the Navy Memorial Museum at the Washington Navy Yard.

Guest speaker for the ceremony was Rear Adm. A.J. Baciocco Jr., Chief of Naval Research, who in his remarks credited "today's improved Navy capability for search, rescue, salvage and recovery and the broad spectrum of advanced technology required to support improved ocean operations . . . to evolutionary improvements of Trieste subsystems and concepts."

Special guests for the ceremony were some of the principals in the historic deep submergence project. They included Jacques Picard, who made the dive; Lawrence Shumaker, assistant officer-in-charge of the bathyscaphe; Don Walsh, who also made the dive and was officer-in-charge of the bathyscaphe; Andreas B. Rechnitzer, technical director for the dive, and Giusseppe Buono, master mechanic for the Trieste.

Business Briefs

Santa Fe Engineering Awarded Contract

Santa Fe Engineering Services Co. has been awarded a contract to provide engineering and management support to the National Science Foundation for the planning of a 10-year, $560 million offshore drilling program.

The undertaking, known as the Ocean Margin Drilling Program, will involve the conversion of the Glomar Explorer into the largest drill ship ever built. The vessel will then be used for scientific drilling with complete well control to depths of 20,000 feet below the seabed and in 13,000 feet of water.

Santa Fe Engineering Services, a subsidiary of Santa Fe International Corp., will have the initial responsibility of reviewing progress made in the program and participating in the areas of program planning, monitoring, alternatives, system integration, and environmental and siting data.

The engineering company also will assist the National Science Foundation, a U.S. Government agency, by providing liason with scientific institutions which are cooperating in the project and with oil companies which will be invited to participate.

The 618-foot-long Glomar Explorer was built in 1973 for the U.S. Government and is now in the custody of the U.S. Navy. At present it is chartered to private industry for an ocean mining research project.

Conversion of the Explorer into a drill ship will include the design and installation of a riser, blowout prevention system and other well control equipment that for the first time will make it possible to drill along the continental margins in water 7,000 to 13,000 feet deep.

Since the Glomar Challenger, which has been operating in a similar manner for the last 10 years, has no riser or well control equipment, the National Science Foundation's Deep Sea Drilling Program until now has been limited to areas where hydrocarbons and related high-pressure formations were not likely to be encountered.

The National Science Foundation's schedule calls for conversion of the Explorer and initial sea trials on the U.S. West Coast by October 1982, and operation in the Pacific Ocean and the Antarctic without a riser for about two years. Since the vessel is too wide for passage through the Panama Canal, it will sail around the tip of South America to the U.S. East Coast where it will be equipped with a riser for deep-water drilling.

At least one of the Explorer's drilling locations is expected to be in the passive margin of the continental shelf off the Eastern Seaboard in water depths of 7,000 to 9,000 feet. This is a region of thick sediment wedges and is an area where significant hydrocarbon accumulations are considered a possibility.

Other areas where drilling is planned include:

—"Active Margins" such as the Mariana Trench east of Japan. These are described as areas at the continental edges where tectonic plates are moving relative to one another.

—The "Ocean Crust" regions near mid-ocean. Drilling in these areas is expected to contribute valuable information about seafloor geology and how the mid-ocean ridges were formed.

Although some of the drilling will be in areas of possible hydrocarbon occurrence, Frank Press, scientific advisor to the President, has stressed that the Explorer program is purely scientific and there is no intention to use it to establish the government in the oil or gas production business.

The Thirty-Sixth Annual Meeting of The Institute of Navigation will be held at the U.S. Naval Postgraduate School, Monterey, California, 23-26 June 1980.

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

JULY, 1980

Vol. XIV, No. 3 Published by the Deep Submersible Pilots Ass'n

The Deep Submersible Pilots Association was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to:

Robert K. R. Worthington
Editor & President, DSPA
3005 Curie Street
San Diego, CA 92122
(714) 453-1158

or

Donald E. Saner
Secretary, DSPA
4707 Berwick Drive
San Diego, CA 92101
(714) 278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman, DSPA
1527 Linwood Street, Apt. 5
San Diego CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

New Members Commander Dick Hall and Tim McClay of the DSRV-2 AVALON are welcomed on board this month.

Frank Busby's report of the MTS Undersea Vehicle Committee meeting at the OTC in Houston on 5 May indicated that the agenda consisted entirely of verbal updates by the attendees of their individual or ororganization's activities with some resultant questions and discussions. The minutes make interesting reading and are included herein because of their widespread general import even though a few DSPA Members were present and many others will receive Busby's report directly. The list of attendees is incomplete and shows Bennett and MacDonald as the only DSPA Members present. (I did not edit, so don't blame the spelling, etc., on me!) I have not heard any comments on the three OTC sessions on submersibles.

MTS'80, 6-8 October at Washington, D.C., will include sessions on both manned and unmanned submersibles as well as pertinent topics in other sessions and a meeting of the Undersea Vehicle committee.

OCEANS '80, 8-10 September at Seattle, Washington is sponsored by the IEEE Council on Oceanic Engineering. There will be a session on submersibles on 9 September.

Will Forman's Committee on Grounded Low Voltage Electrical Systems has finally determined that there is no significant shock or electrolysis hazard and produced a letter from DSPA to the ABS asking for reconsideration of their refusal to certify the Advanced NEKTON design of Doug Privitt.

AUGUSTE PICCARD appears destined for permanent basing at San Diego although Jack Bennett keeps planning for her to transit the Canal one of these seasons. One development after another results in delaying the move, and we in San Diego assure Jack that the welcome mat is not wearing out.

INTERSUB's reported demise, following those of HYCO and Vickers Oceanics, "big guys" in the submersible field, is an event to be viewed with regret and apprehension as to the commercial viability of manned submersible enterprises.

Navigation Into The 21st Century, 8-11 December at Atlantic City, N.J., a symposium sponsored by the IEEE Aerospace and Electronics Systems Society, will include a session on "Undersea Navigation".

SECRETARY'S REPORTS AND NOTICES

Membership certificates--Any Member who has never received a large DSPA membership certificate may request same from the Secretary.

1980 dues--Some Members remain in arrears. It is essedtial that these Members remit immediately to avoid loss of membership. The Treasurer is deployed in Alaskan waters, so I cannot verify that the below list of those in arrears is up-to-date. Please remit or check with the Treasurer if you have doubts.

Beachler
Boulton
Cameron
Guadreault
Helle
Hoyt
Keach
MacDonald
Merritt
Olsen
Plancon
Rees
Sanderson
Saxon
Shumaker
Staehle
Starr
Toler
Vernon
Vetter
Whitfield

Jack Bennett is Chairman of the Nominating Committee whichwill will nominate a slate of DSPA officers for 1981 for upcoming elections. Inputs from Members are desired.

DSPA SAN DIEGO LUNCHEON MEETINGS

4/15/80

Members Present	Non-Members Present
Bob Worthington	Rich Barker -DEEP QUEST
Doug Privitt	
Will Forman	
Don Saner	

An extraordinary number of "no-shows" was attributed to duty travel and income tax deadlines.

Will Forman reported on the status of his committee investigation of low-voltage, grounded electrical systems and stated that he is awaiting documentation from Don Rosencrantz who is absent on official travel. Will appears to be convinced of the merits of the single-wire system from both engineering and safety aspects.

The April NEWSLETTER was distributed and discussed.

5/15/80

Members Present
Bob Worthington
Chris Landrum
Ron Rau
John Schiltz
Jack Bennett
Frank Chambers
Jerry Shiller
Don Saner
Jim Helle
Will Forman
Doug Privitt

Non-Members Present
Kent Kahle -NEKTON, Inc.
Briant Smith -Hydroproducts, Inc.
Tod Slaughter -AUGUSTE PICCARD
Ron Parkinson -PISCES IV (Gov't Canada)
Tim O'Brien -Lockheed Ocean Lab
Al Smith -DEEP QUEST
Rich Barker -LOL
Fred Mahr -LOL
Gideon Wizansky -LOL

Jim Helle reported on North Sea operational situation with regard to deep submersibles and RCV's. He has established Helle Eng'r'g offices in Aberdeen and New Orleans.

Frank Chambers described the highly successful PISCES IV operations, particularly the recent bottom route survey between VancouverIsland and mainland British Columbia. A satisfactory survey apparently was beyond the capability of unmanned vehicles in this case. The high degree of reliability of PISCES IV in her over 900 dives and the effectiveness of the support ship PANDORA II have been most impressive. Frank is spending the week in San Diego along with Ron Parkinson to discuss SAR procedures with SubDevGru I Staff.

Jack Bennett--PICCARD is expected to depart under tow for the Canal enroute Louisiana within a month. Jack reported on OTC and the MTS Submersible Vehicle Committee meeting.

7/11/80

Members Present
Bob Worthington
Carroll Hoyt
Doug Privitt
John Schiltz
Don Saner
Will Forman
Jack Bennett

Non-Members Present
Al Smith- DEEP QUEST
Dave McCafferty- TRANSQUEST
Ken Privitt- MARFAB
Pete Traphagen- NEKTON
Tod Slaughter- AUGUSTE PICCARD

Bob Worthington read letters from Kevin Parker and Alan Whitfield and described the DSPA-IUPA relationship, existing and proposed.

Carroll Hoyt discussed NEKTON's current operations in Alaskan waters. Forman and Traphagen are about to leave for NEKTON submersible ops in the Gulf of Alaska.

Dave McCafferty was welcomed back after six months of repairs and convalescence required after being run down by an automobile.

Don Saner announced that Al Smith is now a fully qualified DEEP QUEST pilot.

Will Forman passed around a draft letter from DSPA to ABS describing reasons for support of and requesting reconsideration by ABS of certification of Privitt's Advanced NEKTON's grounded low-voltage electrical system.

Jack Bennett was appointed to be Chairman of the Nominating Committee for 1981 DSPA officers. He described the hull problems which have been encountered with the PICCARD's newly purchased support tug, explaining why PICCARD is still berthed at San Diego. He also discussed the news picked up at OTC re the unfortunate position of INTERSUB.

REPORTS FROM MEMBERS

Hal Criger (5/15/80)
"I received the NEWSLETTER when I returned from Brazil yesterday so decided it was time to sit down and drop you a line. All is going well with L.P.S. in Brazil, and we should have 8 of 9 wells producing by the end of May or middle of June if everything goes as planned. We have had more than our share of setbacks the last year, but all seems to be going fairly smoothly now. Chris Landrum has AMTEK's "SCORPIO" working, and I can only find good words to say about him and the performance of SCORPIO. It is an excellent tool for our type of operation and was longoverdue in being installed on board ship. MARTECH's RCV was forever broken down or couldn't handle the simplest of jobs we we asked them to do.--Lockheed Petroleum Services was sold Dec.20, 1979 to Alberta Gas and Pipe of Canada, so now we are working for them under the mane of "Can Ocean Resources, Ltd". I had seriously considered trying to get a job back at LOL to continue my LMSC benefits,,but as it works out I lose nothing by the transfer to "CORAL" so will stay with them."

Alan Whitfield (6/5/80)
"I am quite in favour of formalizing the relationship between DSPA & I.U.P.A. However, I would like to point out that, although the I.U.P.A. runs as an independent organization, I personally see us as the "European Branch of the D.S.P.A. Perhaps the Constitution can be amended to reflect this situation. Iam also in favour of changing the name I.U.P.A. to D.S.P.A. (Europe) if you feel this would be of benefit to us all. We would then use your logo. I look forward to hearing your comments."

Kevin Parker (6/ /80)
"Could you please send some application forms to the following people: Dave Weddle .....Bob Allen..... Both these people are JIM suit and WASP pilots and very keen to join. This is not the first time that I have been asked for forms, so could you please send me some as well. I would like to know the requirements for membership as I am, or have been asked by RCV 225 pilots if they are eligible. Sorry, I keep skipping about, one more name for a form is one of the I.U.C. pilots, Tom Kazdik, who can be contacted through their American office. --I am afraid I do not have much more news for you as regards Thalassa except that as a new venture it is going very well and there is a rumour of further vehicles and lots of contracts, especially now that INTERSUB has gone. I'll try to get you a full report on Thalassa's progress as soon as I have something more to report. Is there any chance of larger membership certificates, for wall mounting, etc.; pullovers and badges would also be useful over here."

Kevin Parker (5/7/80)
"I have left Oceaneering and am now working for Thalassa Offshore (Scotland), Ltd, Mains of Kirkhill, Aberdeen. I am the Operations Supervisor on their R.C.V. 225 which is operating from the Dyvi Beta in the Fulmar field. The job consists of assisting stabs' on a six wellhead template and carrying out leg scour surveys on the rig itself.--I hear that DISCOVERER SEVEN SEAS is coming north. If any of the sub team get into their office and want to go for a "wet" they may be able to contact me on Aberdeen 724666. I.U.C.'soffice is about 400 yards from my place of work. I'll be in touch as soon as I have anything else to report."

Don Walsh (2/2/80) (Apologies: should have made April NEWSLETTER)
"Don keach and I have pretty well finishedup our technical advisor work on "Raise the Titanic" and hope the final film comes out as being reasonably accurate. Everything we recommended was feasible if you didn't worry about costs. Fortunately, the drama has the President directing that the mission have highest national priority so the cost barriar is broken.--We leave for two weeks in Saudi Arabia shortly. We have been asked to consult with various agencies on marine matters. Don't think there will be anything on submersibles, but we will get involved in some diving advice. This is our second trip there in the past two years.--The Navy, together with Larry Booda (Editor of Sea Technology) and Andy Rechnitzer, organized a very fine 20th anniversary celebration of TRISTE's deep dive. This was at the Navy Memorial Museum (the old Gun Factory) in Washington, D.C. About 200 people attended the ceremony and the luncheon afterwards. Even Jacques Piccard came over from Switzerland. Trieste is now officially on display at the Museum, and she looks pretty good.--By the way, Jacques Piccard has a new submersible called the A.V. FOREL. It was launched about a year ago , and it has made over 100 dives. I believe that most of them have been made in lakes. It has the acrylic hemihead as well as a small acrylic conning tower. I believe the depth capability is 600 m. Perhaps some of the DSPA members have better information on this boat? He didn't have any handouts with him , and I may not have remembered all the details too well."

Larry Megow (5/20/80)
'The November 1979 issue of the American Bureau of Ships publication "Surveyor" contained an enthralling, well documented article on the evolution of the submersible by Thomas Loughry. I'm certain it must have taken Tom hundreds of hours for all his research. All our readers should thoroughly enjoy this story."

Larry Megow (7/7/80)

*Hereis another bit af startling news about the TITANIC. If the TITANIC is going to be raised, maybe we should all try to get in on the "action".

10 Leading Psychics Reveal Their...

PREDICTIONS

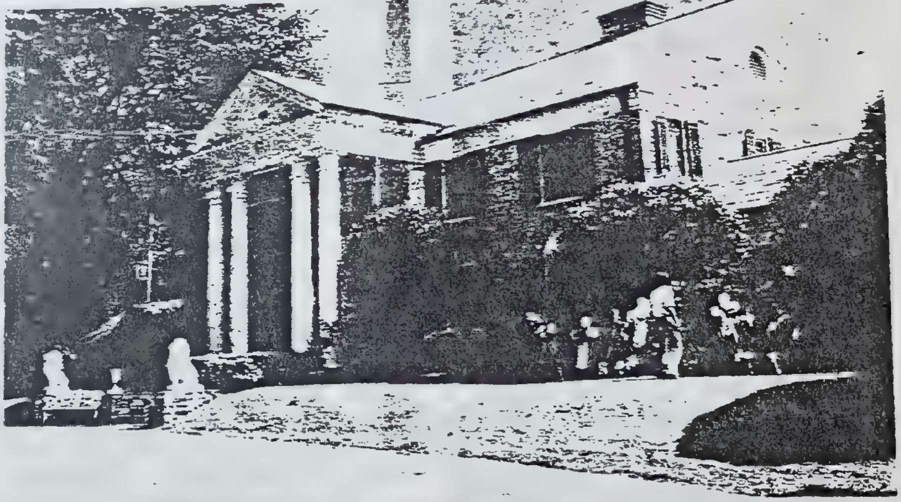
FOR SECOND HALF OF 1980

e dropped from the series after he's ommitted to a mental hospital for seere schizophrenia.

- Sylvester Stallone will break from is tough-guy image when he portrays homosexual priest in a new movie.
- After beating Jimmy Carter, Ronld Reagan will ride through Washington on a white horse and wear a cowboy utfit.
- Scientists will discover a mineral ound in the desert that can cure rthritis.

New York psychic Shawn Robbins, ho has stunned authorities with her mazingly accurate plane crash preictions. foresees:

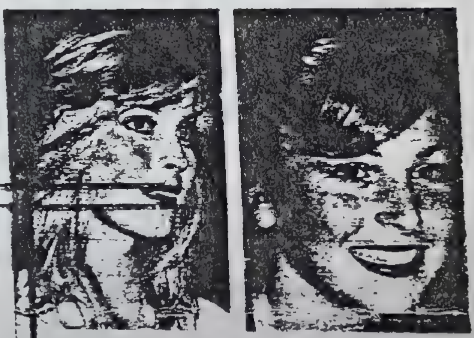
- A top Hollywood producer will set p a sperm bank with the help of oday's biggest stars to develop a new ace of celebrities for the future.
- Elvis Presley's Memphis mansion, raceland, will be destroyed by fire ight after the third anniversary of his eath.
- "Happy Days" star Scott Baio — oping to set an example for America's outh — will shock his fans by proudly oining the Marine Corps.
- Teen actress Kristy McNichol will un off to Mexico and marry a strugling rock singer.
- Over the objections of his wife Pat, ichard Nixon will attempt a return to olitics — and it will cost him his marriage.
- Sophia Loren will share her lifeong beauty secrets by opening a chain f successful rejuvenation clinics.
- Country and western star Dolly arton will open her own chain of tores — specializing in slinky, sexy ngerie.



FIRE will destroy Graceland, Elvis Presley's Memphis mansion.

astrologer Fredrick Davies makes these predictions for the last half of 1980:

- Pope John Paul II will make a historic trip to Russia where he'll argue with Communist leaders on the freedom of worship.
- Burt Reynolds and Kate Jackson will star in a remake of "Gone With The Wind."
- The Titanic will finally be raised from the depths of the North Atlantic — and experts will discover that the famous ship was sunk by a bomb and not an iceberg.
- Bo Derek will be ditched by her Svengali-like husband John Derek and enter a religious retreat to seek spiritual solace.
- Ed McMahon will star in a new hit TV series in which he plays a hobo who



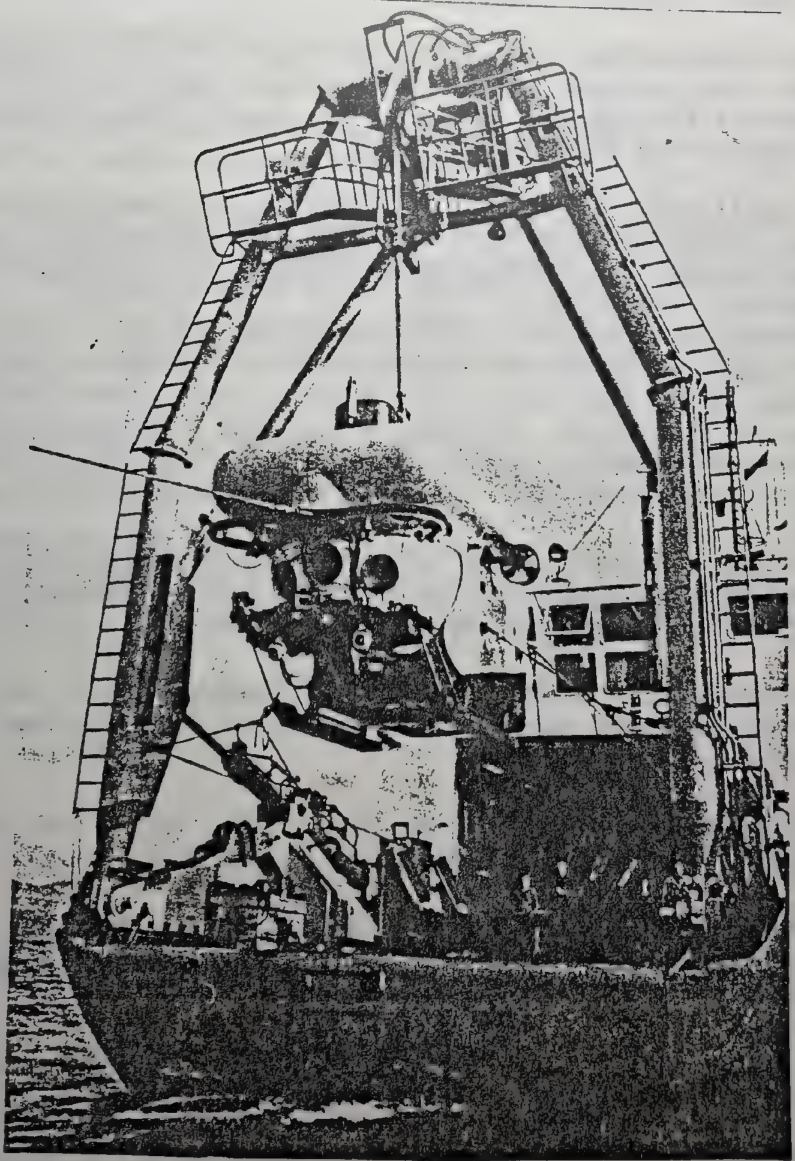
AKING IT OFF: Bo Derek will have off her hair for charity and atum O'Neal will pose nude for a magazine centerfold.

brawl with costar Larry Wilcox. Estrada will then try a new career as a rock singer.

- Burt Reynolds will marry Farrah

Frank Chambers (7/21/80)
"Thanks for a great visit while we were in San Diego. I really enjoyed it.--PISCES IV is just completing four weeks Self Maintenance and, on August 5th, we're off to some inlets on the B.C. west coast to work for the University of Calgary. It seems we have a full programme up to Christmas. I've just added three new people to my crew; so , once they're trained and all, I'll head them in your direction for membership."

Olivier Bouet-Willaumez (6/ /80) "This picture was taken in "January '80 during the sea trial of the "new"PISCES V near Marseille.--We have made the complete refit in five months, and I have been the Project Manager for this very interesting job."



SUMMARY OF

EVOLUTION OF THE SUBMERSIBLES

BY

LARRY MEGOW

In the November 1979 American Bureau of Shipping 'Surveyor', Thomas Loughry wrote an excellent 6,000 word well illustrated article on the evolution of the submersibles. This is a brief summary.

1620 First vessel to navigate under water. Built by Dutch doctor - Cornelius Drebbel. Drebbel's craft was a wooden rowboat covered with greased leather, propelled by 12 oarsmen. Air was supplied by bellows whose tubes and valves were above the surface. A secret substance, thought to be soda lime, was used to purify the air. The craft could submerge 12' to 15' and navigate for several hours.

1652 A 72' long wooden underwater vessel, propelled by paddle wheels, was built by a Frenchman, LeSon.

1747 A submersible, a decked over rowboat built by Englishman Symons, incorporated the first ballast tanks. The ballast tanks were inverted goatskins whose necks projected through the bottom of the boat. When the water was squeezed out, the boat rose to the surface.

1774 Englishman John Day, after building one submersible in which he stayed under water for 24 hours at 30', built another submersible designed to dive down to 132' for 12 hours. Neither Day or his vessel ever resurfaced.

1776 David Bushnell built his famous one man sub - Turtle - the first sub from which work could be performed outside the sub. Bushnell tried to attach a canister of gun powder on to the bottom of a British ship in New York harbor in an attempt to blow up the British ship. Bushnell's hand and foot propelled sub was equipped with an auger-corkscrew device to drill a hole into the ship. But the plan failed when the auger could not penetrate the copper sheathing on the ship's bottom.

1804 Robert Fulton built a sub named the Nautilus which used compressed air for breathing while submerged. Fulton got Napoleon to finance his sub, but when the Nautilus failed to damage the British fleet, Napoleon stopped his financial aid.

1870 Jules Verne, in Twenty Thousand Leagues Under the Sea, imagined a sub operated by electricity and included the first lock-out devices where divers could swim in and out of the sub.

1886 A French Vice Admiral, H. L. T. Aube, built the 55' long Gymnote, powered by 564 battery cells which developed 55 horsepower.

1886 Englishmen Andrew Campbell and James Ash designed a sub also called Nautilus, powered by (2) 45 HP electric motors. This sub had a speed of 6 to 8 knots and an 80 mile range.

1890 Spain built a sub that logged 10 knots on the surface and 8 knots submerged. This sub was equipped with torpedoes.

1890 John P. Holland invented the first sub to use a gasoline engine for propelling his sub on the surface and at the same time to charge the batteries for use under water.

1900 U. S. Navy purchased one of John Holland's subs - 54' long - with a 1500 mile range. Holland also designed 5 subs at that time for Japan.

1929 William Beebe and Otis Barton built a 54" diameter spherical "bathysphere"
in which they finally reached a depth of 3,028'. This 1934 dive was made with the
sphere on a cable. Beebe's sphere proved that spherical hulls were the most effi-
cient for future deep diving subs. One innovation of Beebe's sphere was that it had
(2) 8" diameter 3" thick quartz glass viewports. He also used soda lime to remove
carbon dioxide from the air - the same substance used in the first sub back in 1620.

1948 Auguste Piccard constructed the bathyscaphe (deep boat) called FNRS-2.
The FNRS-2 had a 6'7" diameter pressure sphere fitted with the first conical acrylic
viewports - 6" in diameter. Piccard gave the FNRS-2 to the French Navy. In 1954
the FNRS-2 made a dive to 13,700'.

1953 Piccard redesigned the FNRS-3 with aid from the Swiss government and named
her the Trieste. The U. S. purchased the Trieste from Piccard for $185,000.00 and
in 1960 Piccard and Walsh dove the Trieste 35,800' down into the trench near Guam -
deepest spot in all the oceans.

1960-64 Eleven new submersibles, including the August Piccard, Ben Franklin and Alvin, were launched.

1978 ABS figures show that 88 manned submersibles were in operation, with 17 more being refitted or under construction.

Perhaps the most famous submersible is Alvin, christened at Woods Hole in 1964. Alvin's first hull, a 7' diameter sphere built by Hahn & Clay in Houston using HY-100 steel, was designed for 6,000' depth. Alvin made several hundred successful dives, including retrieving an atomic bomb from over 3,000' in the Mediterranean. In 1973 Alvin was fitted with a new titanium hull, increasing her diving range to 12,000'.

1979 In 1979 Alvin made her most famous dives by discovering hot, mineral laden geysers along the East Pacific Rise just west of the Panama Canal.

If you want to read the entire fascinating, educational and exciting evolution of the submersible, get a copy of the November 1979 issue of ABS's publication 'Surveyor'.

LFM/wm

May 13, 1980

OTC '80 REPORT

By

Larry Megow

The 1980 twelfth annual Offshore Technology Conference attracted more than 87,000 people, including about 7,000 foreign registrations, during the conference's four day run in Houston May 5-8, 1980.

OTC is sponsored by eleven engineering and scientific societies and is supported by the entire offshore industry - worldwide.

More than 2,200 companies demonstrated their experience and capabilities with a fantastic array of equipment, with estimated values ranging from $500 to $750 millions.

During the Conference 280 papers covering all aspects of offshore industry were contributed by professionals from 25 different countries. One reliable estimate was that this vast fund of knowledge represented probably 400,000 of the keenest brains in the offshore industry, including seafloor surveying and mapping, deepwater drilling production and new techniques, metal fatigue, design and contruction criteria for offshore structures, deepwater pipeline technology, instrumentation in all offshore/subsea disciplines, ice/arctic operations, support vessels, helicopters and submersibles (see attached for list of papers given on submersibles).

There were 49 organizations represented from Canada; 21 from the Netherlands; 4 from Australia, 32 from Germany; 45 from France; 31 from Spain; 21 from Japan; 29 from Norway, 85 from the United Kingdom; 15 from Sweden; 10 from Denmark; and some from South America, Mexico and Finland, but the vast majority of organizations represented were from the United States.

Practically every motel and hotel within a hundred mile radius of Houston was filled; hundreds of chartered buses efficiently shuttled OTC participants over 16 routes from as far away as Galveston; and the Astrodome parking lot was jammed with around 50,000 vehicles. But even at the height of activities, pedestrian traffic flowed fairly smoothly through the six indoor exhibits covering 475,000 square feet, plus another 100,000 square feet outdoors.

I did not get to hear the thirteen papers on submersibles, but those papers are attached.

The only two DSPA pilots I got to meet were Larry Schumaker and Don Keats.

It was an exciting extravaganza!

LFM/wm

'80 OTC SUBMERSIBLE PAPERS

Presiding Chairmen:
J. H. Osborn, Naval Facilities Engineering Command
R. F. Busby, R. F. Busby Associates

SUBMERSIBLES I

OTC

3675 **Operations with Tethered Manned Submersibles**
D. J. Hampson and G. S. Hawkes, OSEL Group - OSEL Offshore Submersibles Ltd.

3676 **Development of a Diver Driven Crawler Trencher**
M. Auberty and J. P. Icard, Comex Services

3677 **New Requirements in Deep-Working Submersibles**
J. E. Osterhaug, Honeywell Offshore Operations

3678 **1200-1500 Feet; New Underwater Threshold Demands New Answers From Underwater Contractors**
A. Galerne, International Underwater Contractors, Inc.

SESSION SUMMARIES

As work in the offshore environment proceeds to deeper depths, technology is challenged to provide the best and most effective work systems to solve the needs of industry The mix between divers, manned submersibles, and remotely operated vehicles change as the tasks change. Safety of personnel becomes a greater concern as the water depths increase The first paper discusses three types of manned submersibles, WASP, MANTIS, and a tethered mobile saturation diving bell The second paper deals with the development of a trencher and will give detailed experience based on actual operational deployments. The third paper discusses significant new design requirements established while developing the 90 ton Kvaerner Trencher and provides pertinent results from the test program. The fourth paper gives a historical perspective to deeper diving demands of the offshore industry, concluding that manned free swimming submersibles will be safer and more efficient than monobaric diving bells. The last paper provides a basis for making moon pool operations more safe through better design.

Presiding Chairmen:
J. Pritzlaff, Westinghouse Electric Corp.
J. Lawrie, Solus Energy Systems

SUBMERSIBLES II

OTC

3719 **Automatic Pipeline Inspection System Using an Unmanned Submersible and a DP Surface Support Vessel**
Y. Durand and D. Le Bouteiller, INTERSUB

3720 **The Small Remote Controlled Vehicle as a Work Tool**
D. Michel, Taylor Diving & Salvage Co., Inc.

3721 **Assistance Up to 3300 Feet Depths**
G. Fleury and J. P. Bertoncini, Comex Service

3723 **Instrumentation and Operation of Unmanned Submersibles for Comprehensive Platform Inspection**
L. O. Gay and A M. Watt, Sonarmarine Ltd.

3724 **Field Tests of a Deep Ocean Cable Burial Concept**
P. K. Rockwell, Civil Engineering Laboratory

SESSION SUMMARIES

Pipeline inspection using an unmanned submersible is discussed by Intersub. The vehicle carries a full suit of inspection instrumentation. Sonar marine describes operations of their large unmanned inspection and work vehicles. Operation with a small inspection vehicle, RCV 225 that has been used to do work, is discussed by Taylor Diving and Salvage. This small RCV has placed shaped charges, inspected the set up before firing and confirmed the results after firing. The question of whether an unmanned vehicle should be designed for specific tasks or general tasks is covered by a paper from Hydroproducts. Remote burial of cable at depths of 6000 feet is described by the Naval Civil Engineering Lab. An orbital vibrating plow with a vertical water jet can bury previously laid cable to depths of 3 feet at speeds above 1 knot. COMEX gets man into the work system with a description of their MOB-1000 Manipulator Observation Bell. This two-man one-atmosphere tethered work system operates to depths of 1013 meters, and has performed a variety of inspection and operational work tasks.

Presiding Chairmen:
J. Hughes, Hydro Products Inc.
D. Mitchel, Taylor Diving and Salvage

SUBMERSIBLES III

OTC

3765 **Inspection of Concrete Platforms: Crack Detection by Current Density Measurements**
J. P. Bournat, INTERSUB Developpement

3766 **Electrical Shock Hazard Protection System**
C. Yemington and H. Miller, Perry Oceanographics, Inc.

3767 **Closed Loop Control Systems and Hydrodynamics of a Tethered Submersible**
A. J. Fyfe and G. T. Russell, Heriot-Watt U.

3769 **Microprocessors in Remote Subsea Equipment**
T. McCain, Perry Oceanographics, Inc.

SESSION SUMMARIES

Remote operating vehicles are now well established as an effective tool for performing underwater inspection and work tasks. This session presents papers which discuss technological improvements to the vehicle systems which enhance their capabilities in the underwater environment. The first paper discusses the operational techniques used and results obtained when performing crack detection tasks by current density measurements, on concrete platforms. The second paper presents the details of a shock hazard protection system which has a low false alarm characteristic and is applicable to both standard, and high voltage and high power remote operating vehicles. The last three papers address the command control, data acquisition and transmission, and man-machine interfaces of underwater vehicle systems.

International Underwater Pilots Association

DEEP SUBMERSIBLE SECTION.

Secretary:- A. Whitfield,
12 Frankton Ave.,
Haywards Heath,
West Sussex. TEL:- 0444-892066.

APRIL 1980.

"SCANNINGS".

1.News from Ron Connor,that Mermaid VI.A. is now in Yugoslavia. Mermaid VI.B. is still under construction.

2.British Oceanics has Vanguard (Pisces 3 & 8) in the Med;Viking on Brent (LI & L2);and Voyager involved with Navy trials and cable-burial.(L5 & Taurus)

3.Tony Webb has been involved with trials and training on Spider.

4.Mantis 003 is doing inspection work in the Piper Field,working off Tharus.Mantis 004 is working in Norway.

5.Ken Brumby is with Pisces VI.,supporting deep drilling off Africa.

6.Arms I. is on the Glomar Atlantic off Spain.(Simon Roddy, Fred S-P, and Forbes Ray.)Arms II.on Pacnorse I.Arms III. is now on the Borgny Dolphin.Arms IV. is still under construction.

7.Kevin Parker has left Oceaneering and joined Thalassa on the RCV.225. project.(Auk Field).

8.During the Spring,Lloyds carried out the first ever assesment of submersible pilots using NDT.equipment underwater.The sub used was Mantis 004,andthe pilots who received a Lloyds NDT.certificate were Paul Bunce,Les Sandry,and myself.

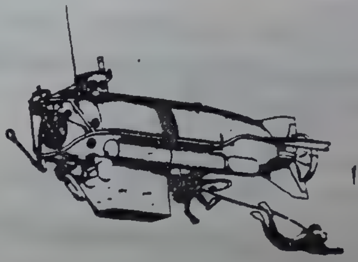
9.Jarle Aksnes and Rune Breivik are at present involved with the acrylic sphere/inspection sub "Checkmate" in Norway.

SOUS-MARIN D'INTERVENTION « LICORNE »

The SMI « LICORNE » is a small diver lock-out submarine to search and recover underwater devices. It can explore a 4 km² area in a single dive.

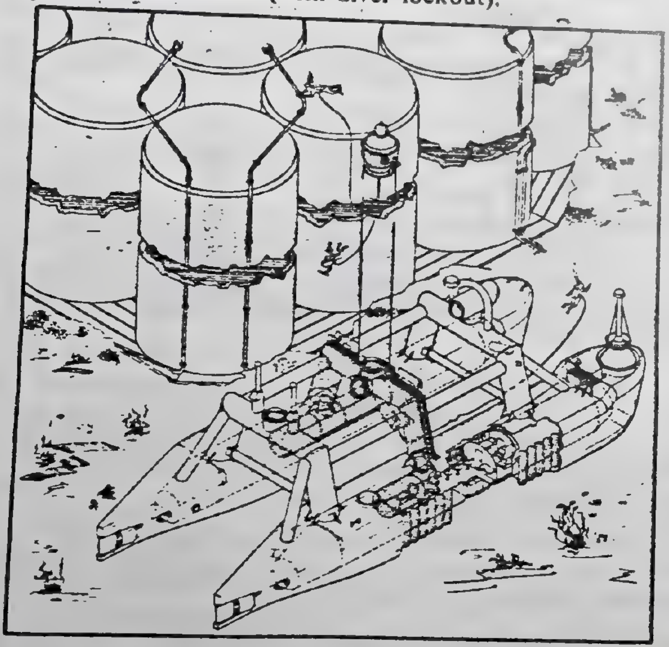
MAIN FEATURES :

- Weight : 11400 kg
- Length : 7.4 m
- Crew : 5 including 3 divers
- Maximum depth : 300 m in search dives
  250 m with divers lock-out (saturation dives)
- Payload : 400 to 700 kg according to the mission
- Power : 2 droppable Cd - Ni batteries : 32 kWh
- Detection : Panoramic sonar



Catamaran submersible. Bruker Meerestechnik has developed a revolutionary type of catamaran submersible workboat. The *Subcat* can operate independent of a surface support vessel in waters up to 300-m deep and has a cruise radius of about 800 nautical miles. The underwater displacement of this unique vessel is about 800 cu. m. It is almost 35-m long and 15 m across the beam. The crew comprises 16 men plus nine divers.

The vessel's life-support system is designed for a maximum of 20 days. Underwater applications foreseen for the *Subcat* include pipe line alignment work and repairs (using underwater welding, when necessary), core drilling and transportation of equipment. The submersible can be optionally equipped with a diving bell and a smaller submersible (with diver lockout).



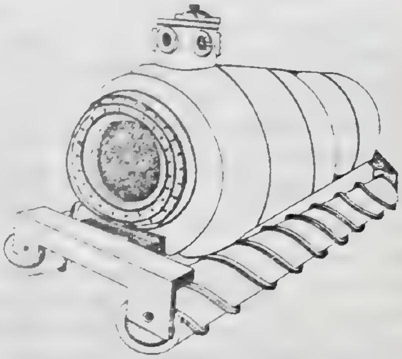
SUBMERSIBLE CATAMARAN. A subsea diving support vessel was designed to work without surface support. The submersible catamaran, *Subcat*, has a range of 800 nautical miles.

Submersible under construction. Aware of the necessity of providing equipment able to dive to greater working depths and still provide advanced working facilities, Bruker Meerestechnik has concentrated considerable design and development work on a new series of manned submersibles, the Mermaid Class. The *Mermaid VI* is specifically designed to carry out offshore tasks underwater or to function as a lifesaving unit for rescuing the crews of sunken submarine craft. Two versions of this vessel are currently under construction.

New unmanned submersible. Very shortly, Preussag AG expects to complete the first of a new series of unmanned, remote-controlled submersibles—the *Fuge*. Primary task of this underwater vehicle will be the inspection and maintenance of underwater installations, offshore site investigations, and well completion duties. The 5-ton vehicle will be 4.9-m long, with a beam of 1.4

Q. I have heard that MSC is working on an underwater tractor. Are you getting close to a commercial application?

HIGLER: We are now in the process of developing the unit with trials both on the seafloor and onshore. One important advantage is that its traction does not depend on tracks or on rubber tires. Instead, traction is achieved through employment of the Archimedes screw principles. The unit has two cigar-shaped cylinders with helical fins wound around them. By counter-rotating the two rolls—or cylinders—one gets a screw action with balanced transverse loads, but with longitudinal resultants of loads that produce traction.



ARCHIMEDES SCREW PRINCIPLE will be used to power seafloor work vehicle.

This principle of traction has been investigated for military use for years, and a small Dutch firm has manufactured a number of surface vehicles that have proved very successful in operating in mud flats near shore.

In developing the vehicle, we set out to achieve the utmost simplicity in design and the maximum flexibility in performance. The only rotating parts are the two cylinders which are driven by an off-the-shelf hydraulic motor. The cylinders are naturally buoyant, so the vehicle weight is not encumbered by a heavy traction system.

Our development aims at designing the system for all top soil types and the reliable delivery of the required traction loads.

Tests thus far, indicate that the unit will have a number of advantages in seafloor performance. Steering is quick and positive, and when desirable the unit can move transversely at high speed by rotating the cylinders in the same

VELDWIJK: Our company is also developing a new underwater vehicle. It is a Remote Controlled Vehicle (RCV). The vehicle, which we have named *Smit Sub*, will have sufficient horsepower to tow its own umbilical and it can carry up to 300 kg of extra weight. It can operate to depths of 300 m.

Our first operational vehicle is now being used for wreck inspection; and a second unit under construction will be used in inspection service. We plan a third for platform inspection.

Certification and Classing of Diving Facilities

The Options

In order for a company to be able to use their diving facilities there is a requirement that certain components be either certified or classed by a recognised independent classification society, e.g. Lloyd's Register of Shipping, Det Norske Veritas, American Bureau of Shipping to name but three.

The fundamental difference between certification and class is that the latter is maintained by regular surveys conducted by the classification society.

These societies publish Rules, for the purposes of this article those applicable to submersibles/diving complexes are especially relevant, which contain their requirements regarding the design, construction, testing and surveys of the apparatus to be classed by them. It is interesting to note that the societies' published Rules govern "classing" whereas their published guidance governs "certification" procedures. The procedures followed during construction are identical and may be briefly described as follows.

The owner submits to the classification society plans, pertinent data, design calculations, etc., the society vets and where appropriate approves such submittals.

The apparatus is then fabricated/constructed to the approved plans under the scrutiny of the societies' surveyors.

Upon completion, and subject to satisfactory testing and final survey, the apparatus will either be given class, i.e. pertinent details included in the society's Register or Record Book in addition to being identified with the society's notation which includes the ✠ character, or if certification only is being sought the society issues a certificate indicating that the apparatus has been built under survey and that it fully conforms to the approved plans and specifications.

The ✠ in the society's Register indicates that the apparatus has been built under survey; this mark is omitted from the Register where another society/agency was responsible for the initial "classing/certification" exercise.

As previously stated in order to maintain class the apparatus must be periodically surveyed and tested as detailed in the societies' Rules and any defects identified must be rectified accordingly. For apparatus certified however it is up to the owner how often and to what extent the inspection programme is conducted.

Statutory Requirements

SI 940 of 1976 The Merchant Shipping (Registration of Submersible Craft) Regulations require that submersible craft, defined as "any description of manned mobile submersible apparatus which is designed to maintain some or all of its occupants at or near atmospheric pressure and includes free self-propelled, tethered, towed and bottom contact propelled apparatus" be registered with the Secretary of State (in effect the Department of Trade — Marine Division).

The DOT have clarified the definition in so far as mobile has been defined as *capable of both horizontal and vertical movement*, i.e. a conventional diving bell capable *only* of vertical movement is not considered a submersible craft for the purposes of the Regulations and does not therefore require registration.

In order to register a submersible the following has to be submitted with the application:

(a) *General description of submersible craft* (standard configuration)
Name (if applicable)
Particulars of registration as a ship (if applicable)
Builder
Designer
Owner
Operator
Date of build or launch
Overall dimensions
Collapse depth estimation
Drawing showing layout, principal parts and construction materials of the craft with general description.

(b) *Classification*
Name of classification society under whose surveillance the craft was built, class awarded and date.
Name of classification society with whom currently classed (if different from above).

Note that (b) above requires the submersible to be classed. Moreover the regulations apply to "any submersible craft which is:

(a) operated within waters which are in the United Kingdom or which are adjacent thereto and within the seaward limits of territorial waters,

or

(b) launched or operated from a ship registered in the United Kingdom or a British ship not registered in the United Kingdom."

(a) makes the regulations applicable to offshore installations whereas (b) applies to ships, i.e. in both cases the craft must be registered.

Intersub

Intersub Four and two submersibles, *PC 1205* and *PC 1804* recovered the 'black box' and one engine from a twin engined jet which was lost recently with all ten passengers while coming in to land at Nice in the South of France.

Oceaneering

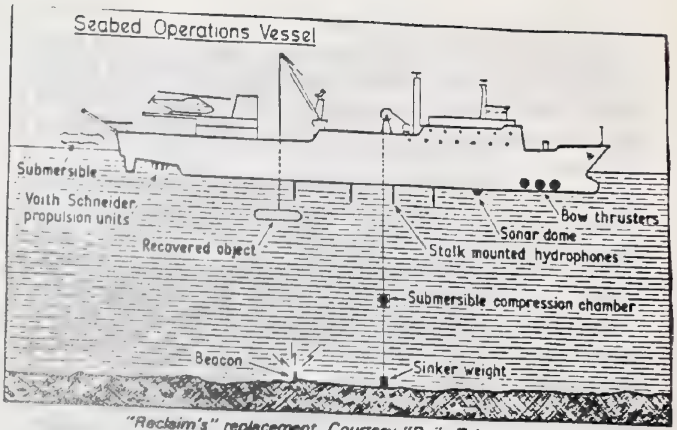
A recovery exercise of another type has recently been carried out by ARMS 2 manipulator bell in 1572ft off the Northwest Irish coast. The one atmosphere bell was used to recover a BOP stack dropped from the drillship, *Pacnorse 1*.

Supership will replace 'Reclaim'

The deep-sea diving vessel *HMS Reclaim,* the oldest commissioned warship in the Royal Navy, recently left the Pool of London on her last voyage.

The 1200-ton ship was launched in 1948, and is the only vessel to have appeared at Spithead in both the Coronation Review in 1953 and the Silver Jubilee Review in 1977.

Among notable "firsts" to her credit are two world diving records, 535ft in Loch Fayne, Scotland, and 600ft off Norway. She has recovered many wrecks, including the two submarines *Truculent* and *Affray* (see *Diver's* recent series by the late Captain Bill Shelford); and she asssisted with the recovery of the prototype RAF Tornado fighter which went down in the Irish Sea in June.



"Reclaim's" replacement. Courtesy "Daily Telegraph".

Reclaim will be replaced by a vessel in the forefront of modern naval diving technology and which has an additional intelligence-gathering capacity.

The £70m ship has just been ordered by the Navy, and is due for completion in two to three years. Her full complement will be 185 officers and men.

Known officially as a "seabed operations vessel" (SOV), she will be 440ft long with a 59ft beam, a displacement of 72 000 tons, and a top speed of about 15 knots. She has taken two years to design.

Although much of her specification is still secret, one of her main features is known to be a "dynamic positioning system" using three bow thrusters and multi-directional Voith Schneider propellors aft. This will enable her to remain stationary over an object on the seabed in rough weather.

Wrecks are pinpointed by transponder beacon which sends sonar impulses to stalk-mounted hydrophones on the underside of the hull. This data is passed through a computer which itself regulates the thrusters and propellors for precise positioning. The beacon can transmit a signal from more than 1000ft down.

The ship will carry a diving-bell for prolonged "saturation" work, and can accomodate a mini-submarine. A helicopter will be part of her standard equipment, and she will have a "moonpool" which will enable divers, the bell, and recovered objects to be winched up through the bottom of the ship, instead of over the side, for greater safety and security.

Pipe follower for submersibles

A pipe following system, claimed to be unique, highly accurate and light in weight has been developed by Location Technology, Irish manufacturer of metal detection equipment. Called Pipelok II, the system is designed specifically for submersible vehicles. It can detect and follow a buried undersea pipeline, and provide information on depth of burial and heading.

The system, marketed in the UK through Oceonics under the name Loctrak, is described as stable and extremely easy to operate. The sensor heads can be replaced on site without disturbing calibration.

Syntactic Foam Increases Payload of Sub at Great Depths

Alvin, the deep-diving research sub operated by Woods Hole Oceanographic Institution, will soon be fitted with syntactic foam to add 1,000 lb to the vehicle's payload capacity at service depths of 13,120 ft.

The syntactic foam, developed by Emerson & Cumings, will be installed by Astronautics Industries of Marlboro, Mass.

Submersibles

Researchers at Heriot-Watt University have been engaged in the construction and operation of unmanned submersibles since 1970. Their objective is to produce a fully automated vehicle capable of performing a wide variety of search, survey and recovery tasks. To this end ANGUS 001 and ANGUS 002 have been built and operated at sea.

At present ANGUS 003 is being constructed with the research emphasis shifting from a cable-controlled to a free-swimming vehicle. Separate programmes study the vehicle, control, communications, navigation and instrumentation.

Habitats

A two-year feasibility study is being carried out at Glasgow University into the use of one-atmosphere manned underwater habitats for subsea oil production in depths greater than 500 m. The work is being carried out in collaboration with Sir Robert McAlpine and Sons Ltd.

Information from many sources is being assimilated and assessed under the following headings — past habitat designs, subsea oil engineering, atmosphere control and physiology, access, rescue and escape, power supplies, safety, psychology and human factors.

Comex investigates diving deaths

THE DIVING industry is still stunned by the tragic news that three Comex divers and an African medical assistant, died during a routine bell dive off the *Wodeco V* drillship, operating for Phillips in Ghanaian waters.

After a successful dive, says Comex, the bell had been hoisted to the ship when for a yet unexplained reason it dropped to the bottom (130m) with two divers trapped inside.

An emergency plan was immediately implemented with Phillips help. Equipment and personnel were flown to Abidjan (Ivory Coast) by special charter planes from Gabon, Cameroon, France, UK and the US.

In the meantime a rescue diver attempted to reach the bell on surface demand but after reaching 90m he got into trouble and asked for assistance.

The standby diver recovered him rapidly and the rescue diver was put in a deck compression chamber with a military doctor and an African male nurse. Therapeutic treatment failed to revive the diver however and he died soon after.

The African male nurse was decompressed but suffered from decompression sickness and he too died having been put back into the chamber once again.

Oceaneering then sent JIM suits to assist in the recovery of the bell. This was finally done by use of a grapple controlled from the surface but when the bell was brought on board the drillship the two crew men were found to be dead.

ROV Operations Experience

Inspection/monitoring accounts for about 90% of ROV offshore operations. (This figure is expected to drop with a heavy trend toward specialization.) Average daily operating costs have decreased in the last year from around $3,000 to $2,200.

Some years ago ROVs were advertised as deployable from ships of opportunity but this proved overoptimistic, especially in the North Sea. Ideally, a support vessel should have twin screws and a bowthruster. Dynamically-positioned vessels are considered too expensive. Furthermore, automatic action could damage an umbilical or vehicle. Intersub reportedly plans to make *Intersub Five* the first ROV-dedicated support vessel.

Operations are carried out either anchored or underway. Staying within a prescribed "footprint", the ROV usually works abeam of the vessel (away from screws and bowthruster). "Fixed platform inspection is conducted from a ship or barge tied up to the platform," Busby notes. "Only one North Sea operator, Sonarmarine Ltd., is approved to use the platform itself as a support base."

Most operators launch and retrieve ROVs from conventional ships in up to Sea State Four (above which insurance may not be available). Semisubmersibles increase the capability for RCV-225s operations to Sea State Eight. At least one ROV has been totalled during recovery.

Operations require clear communications among ship's master, ROV pilot, winch operator and navigator. The support crew employs one to seven personnel. Average dive duration is three to five hours. Effective pilot time ranges from one to four hours (or up to eight hours for tasks requiring minimal concentration).

Most support crew members come from electronics backgrounds. Training, unique to each operator, varies from simply assigning personnel to a crew to multi-week courses given by manufacturer and/or operator. Minimal training is considered six months (one season) to a year. Job times and lengths cannot be specified in advance. As Busby points out, wives take a dim view of this and operators face continual recruitment problems.

Tangled and Torn Tethers

Although ROVs perform the required tasks, like anything else at sea they seem particularly prone to Murphy's Law. At least twelve ROVs have been lost. (One was sucked neatly into a bowthruster which produced an expensive shower of metal bits on the other side.)

The ROV's umbilical is the key weakness. There is "a vast potential for fouling every time a tethered vehicle is deployed," Busby says. Among other causes, fixed structures are often festooned with monofilament fishing lines. Other problems include power surges (with motor power dropping, the ROV may become positively buoyant and rise uncontrollably into a platform).

In addition, cables break on contact with structures and other lines. When *ST* visited Busby this fall, he had just returned from ROV trials off New York. Asked how the tests went, he grinned and said the ROV was now doing longterm materials studies 150 m down on the floor of the Hudson Canyon. The cable ruptured against an offshore lobster pot line.

Various procedures minimize umbilical vulnerability (entering structures on a horizontal plane, working on slack tide or from downcurrent side, placing a TV camera so it can scan the umbilical) but none is foolproof.

With minimal danger to human life, ROVs often perform certain tasks (primarily inspection and monitoring) more cheaply than divers or manned submersibles. Specialized ROVs offer unique capabilities, such as *in situ* repair of seafloor telephone cables (by AMETEK Straza's SCARAB). A Navy tethered ROV operates to six km depths, the current operational limit of manned submersibles.

An untethered ROV built for manganese nodule surveys also works at those depths. With advances in power supplies, data processing, communications, manipulators and other areas, untethered ROVs will eventually participate in many kinds of ocean operations.

Worldwide, the rapidly evolving ROV fleet numbers about 156, according to a study made this year by R. Frank Busby Associates, Arlington, Va. (Performed for the National Oceanic and Atmospheric Administration's Office of Ocean Engineering, the report, *Remotely Operated Vehicles*, is available from the Government Printing Office, Washington, DC 20402, stock number 003-017-00465-1. *Sea Technology* here draws heavily on the report.)

Of these 156 ROVs, 112 are tethered freeswimming, 17 are bottom crawling, 17 are towed and 10 are untethered. (This does not count more than 120 PAP-104 mine neutralization vehicles built by Societe ECA, Meudon, France.)

Five years ago this total was only 20 ROVs, mostly working intermittently on military and scientific tasks. Offshore oil and gas operations have generated an explosive growth and now support about 90% of ROV operations.

Future ROV Activities

Like manned submersibles and divers, ROVs respond to the vagaries of offshore industry. ROV use should increase, particularly in the North Sea where regulations often seem tailormade for unmanned craft. The role of ROVs versus manned submersibles and divers is unclear, but one can note that the U.K. government coordinates a research program aimed simply at replacing man underwater. In the meantime, ROVs are expected to support saturation diving to a greater extent.

In the long run as power sources, through-the-water communications and vehicle "intelligence" improve, untethered ROVs should replace tethered systems for many tasks. Operations in increasing water depths and under ice should speed this process.

ROVs may also play an expanded role in general ocean work. Besides continuing military work (like recovery of a Tomahawk missile this fall by CURV III) ROVs could play an increasing role in scientific research. ("The potential scientific user hardly knows what an ROV is," Busby says.) Other explorations awaiting funds include a survey of the *Titanic* with a yet unbuilt I.S.E. vehicle.

Underwater Vehicle Built for North Sea Operations

Design Diving Systems Ltd., Great Yarmouth, England, has built a remotely operated vehicle specifically for North Sea operating conditions. The microprocessor-controlled "Sea-Veyor" was designed principally for visual inspection but standard undersea equipment and instrumentation can be added. Vehicle propulsion is by closed loop hydraulic thrusters, with variable speed from zero to full in any direction, according to the company.

Sea-Veyor forms part of a complete system (also including control console, handling equipment and spares) which fits a standard twenty-foot container.

Int. Submarine Engineering Gets DART Contract

International Submarine Engineering Ltd., Port Moody, British Columbia, Canada, will supply a Deep Access Reconnaissance Television (DART) remotely operated vehicle to the Defense Research Establishment Pacific. The vehicle will inspect subsea structures to 360 meters, offshore Canada and under Arctic ice.

Dubbed the "flying eyeballs" by divers, the RCV-225 Remote Controlled Vehicle manufactured by **Hydro Products** is fast becoming a major component of diving and offshore services around the United States and in Europe. In a recent edition of the Hydro Products' magazine *Seahorse*, the extensive use of and variety of services performed by the RCV-225 were featured. The 26-inch diameter vehicle is equipped with a special low light level TV camera, the source of its nickname, and can be used to augment or replace the services of a diver, particularly in hazardous areas. Santa Fe Diving Services Inc., a subsidiary of **Santa Fe International Inc.**, is making extensive use of the RCV-225 for deep water surveys, job site identification, inspection of pipelines, and taking ultra sonic readings. Other companies have made use of the unmanned vehicle for offshore platform inspection, pipeline inspection and placement, salvage missions, and platform construction. **Taylor Diving and Salvage Company** put the RCV-225 to use recently when they were called to work on the Ixtoc Well blow-out. Overall the unmanned vehicle is seen as a technical advancement which will save time, money, and, most importantly, divers' lives. To receive a free copy of *Seahorse* magazine, which includes information of this vehicle, contact Jill Jones, Editor, Hydro Products, P.O. Box 2528, San Diego, California 92112. Other news from the **Tetra Tech** subsidiary is that Hydro Products is expanding their Houston operation into larger facilities to provide better service to their Gulf Coast and Southeast United States customers. Their new address is 2400 Central Parkway, Suite B, Houston, Texas 77092; 713/688-6963.

ROV with CCD Camera to Film Fastest Spreading Center

This month a mostly French expedition will examine a site near Easter Island along the Eastern Pacific Rise where seafloor spreading is 6 to 18 cm per year, greater than at any other known location. Scientists expect unusual geological activities and perhaps life forms like those found at the Galapagos Rift and 21 North sites. The remotely operated vehicle *Ray*, equipped with the RCA/Benthos Charge Coupled Device (CCD) TV camera, will make surveys.

Another expedition, employing the *Alvin* submersible and towed camera sled *Angus*, may be underway in the area in 1981 or 1982. This would be a joint French-American effort, coordinated by the Centre National pour L'Exploitation des Oceans (CNEXO) and the National Science Foundation. □

A new glue for the repair of ships and oil and gas pipelines has been developed in the Soviet Union. This new adhesive called "Sprut" makes repairs possible in water or petroleum-based products without extensive cleaning prior to application. It can also be used with fiber glass and other reinforced plastics and has extensive applications for emergency repairs, including sealing holes and flaws in pipelines, repairing waterproofing in the open and in water, and reinforcing corroded pipes. Licenses for production of the glue outside of the Soviet Union can be obtained through "Licensintorg," the official agent in the Soviet Union. To contact them for more detailed information, please write to Igor V. Mayshev, Deputy General Director, Licensintorg, Moscow, 113461, Kakhovka Str. 31, USSR.

Cal Dive Intl., Comex Services Reach Agreement on Equipment

Comex Services, Marseilles, France, and the newly-formed Cal Dive International, Santa Barbara, Calif., have reached a working agreement whereby Comex equipment and specialty expertise will be available to Cal Dive. The agreement will enable Comex to penetrate markets which until now have not been available to the company.

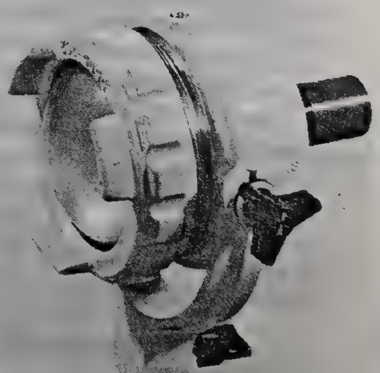
Cal Dive, which actively started pursuing the market less than 8 months ago, will now be able to expand its services. The agreement will help Cal Dive expand its services and become an established offshore contractor in a shorter period of time than if the company had to develop a complete line of capital equipment.

Lockheed Petroleum Services Sold To Canada's Husky Oil

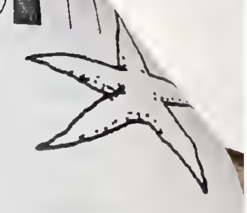
Lockheed Petroleum Services, a subsidiary of Lockheed based in New Westminster, British Columbia, is being acquired by Husky Oil of Calgary. Terms have not been disclosed.

Lockheed designs and manufactures one-atmosphere subsea completion systems and subsea service capsules. Lockheed installed and commissioned the world's first one-atmosphere wellhead cellar in 114 m waters in the Gulf of Mexico in 1972. Since then it has installed a similar system off Brazil in the Garoupa oil field. Lockheed also established a world "first" with the one-atmosphere welding operation comleted on the Thistle "A" platform in 161 m waters in the North Sea.

Undersea TV Light



Snooperwide™ replaces thallium iodine and mercury vapor lights for color TV work; wide-angled closed-reflector underwater light with diffused beam pattern of about 55° (in air) and color-corrected 120-V, 650-w bulb. Birns Oceanographics



One Half Fathom

Mrs. Dan J. Fager
Editor & Publisher
4004 BAY TO BAY BLVD. TAMPA, FLORIDA 33609

Export permit for submarines withheld

NORTH VANCOUVER — (CP) — The president of a North Vancouver engineering firm says he is getting the runaround from defence department officials in Ottawa over sale of four submersibles to the Soviet Union.

Mack Thomson of International Hydrodynamics Ltd., says he has been waiting seven months for an export permit that would let him begin work on a $19.5-million contract to supply one manned submersible and three remote-control underwater craft to the Soviets.

Thomson, designer of the Pisces submersible, said his company sold two similar craft to the Soviets several years ago and both are currently being used in the Red Sea.

He said a meeting with Defence Minister Allan McKinnon revealed there are classified documents relating to the sale but he doesn't know what they contain.

Thomson said he believes someone in the defence department is concerned the devices have strategic military value even though the Soviets know about the system and helped Canadians produce the Pisces power system.

He thinks the fact the Pisces can go three times deeper (to 6,000 metres) than the first submersible sold to the Soviets is what concerns defence department officials.

"I think they believe it might be used for monitoring U.S. and Canadian submarine communications systems."

He said the Soviets will not pay for the devices until the export licence is granted.

Contract Signed for German Underwater Simulator

Dragerwerk AG, West Germany, has signed a contract with the GKSS-Research Centre Geesthecht for construction of an underwater simulator similar to a large pressure chamber. The simulator would be employed in development of German underwater technology. Manned diving tests and underwater work to pressures equivalent to 600 m depths and unmanned tests to 1000 m will be performed under realistic conditions.

The new *Mermaid VI* submersible has been added to the **Bruker Meerestechnik GMBH** family of submersibles. The submersible, which is designed on the basis of the three-spherical pressure hull principle, has been certified for diving operations to a depth of 600 m. Specifications on the submersible include a specialized dry transfer for rescue missions, inspections and maintenance tasks; steerable main thrusters, a bow thruster and two vertical thursters; Bruker's specially designed manipulator arms; a large bow window (1100 mm); and an extremely efficient diver heating system for the diving chamber and suits to extend diver lockout time in deep, cold waters. The first two *Mermaid VI* subs were successfully tested last September at the Karlsruhe-Rhine harbor and are currently on order.

Bruker Meerestechnik Gmbh also announced in February that it will move from Forchheim to the Karlsruhe-Rhine Harbor area in order to obtain direct access to the Rhine River and increase significantly its area for building submersibles and other offshore equipment.

Sub-sea lead for Russia?

A deep-diving submersible which could give Russia a world-lead in underwater research is being built for Moscow in Canada.

The vessel, *Academik*, is being built at Vancouver, British Columbia, under a £10 million contract. It will be able to dive with three men to a depth of 6000 metres.

Its equipment includes a stereo-camera, a comprehensive television system, and underwater turbulence sensors which could provide vital information for submarine and anti-submarine warfare at great depths.

The vessel has been designed by the man who produced the Pisces-type submersible which has been used to help lay and maintain the American Sosus submarine detection barriers on the seabed to give warning of Russian submarines entering the Atlantic between Greenland, Iceland, and Scotland.

The contract also calls for the production of three unmanned rescue and support vehicles capable of diving to 6000 m in case the *Academik* gets into difficultues at a depth too great for any other existing vehicle to reach.

The special crew chamber for the submersible is being made in Switzerland and the vessel will be able to operate for a maximum of 72 hours.

Chuck Fives, Chief Pilot and Operations Manager of the CONSTRUCTOR. (see pg. 37 last month) Mr. Fives says that BIBS stands for "Built in Breathing System." This is an emergency breathing system to be used in submersibles in the case of contamination of the environment. The system is very simple and above all highly efficient, giving two men a thermal reacting closed circuit breathing apparatus. The system has been tested at D.C.I.E.M. in Downsview, Ont., and during a series of test dives in the DDS CONSTRUCTOR in Halifax.

7/80

PC-1602 Shipped; Third System For Saipem S.p.A.

Shipment last month of the PC-1602 submersible (see photo, Page 1) to Saipem S.p.A. in Italy marked completion of Perry Oceanographics' major submersibles effort of the last year. The four-man, 3,000-FSW-rated submersible, now preparing for sea trials in the Mediterranean, is one of three systems supplied by Perry for support of a transMediterranean pipelay project.

Earlier this year, Perry shipped a 3,000-FSW observation maneuvering bell and a bell handling system to Saipem for installation on the pipelay support vessel Ragno Due. The PC-1602 also will be based on the support ship during the pipelay mission.

PC-1602 passed local sea trials prior to air shipment last month. Participating in the trials was Robert Lewis, Perry project engineer for the submersible.

Later this year, PC-1602 and the other Perry systems will help support the installation of three gas lines across the Mediterranean between Sicily and Tunisia. These lines are part of a system connecting to landlines which will supply Algerian gas to the Italian mainland.

Saipem's automated pipelay barge Castoro Sei will perform the lay with close support from Ragno Due and its Perry-built systems.

12 Transferred Successfully In Underwater Sub Mating Tests

After a four-year development program, British Oceanics Ltd. has completed a one-atmosphere underwater mating system which uses submersibles to transfer personnel in oil field production and naval rescue operations.

The system incorporates a specially designed mating skirt, fitted to the submersible through a positive lock between the submersible and the pressure hull of a military submarine or subsea installation. Neutrabaric decompression brings the water between the two to atmospheric pressure.

In recent trials, the *L1* submersible operated from the mother ship *British Viking* to transfer personnel from the Royal Navy's submarine *Odin*, in 400 ft of water. Twelve personnel were transferred in four different operations.

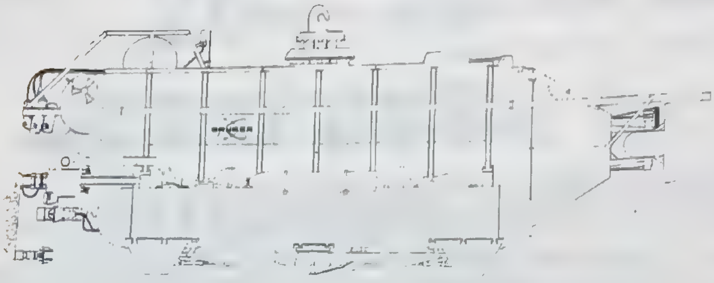
Subsequent trials, using the *Taurus A* and *LR5* submersibles, and the mother ship *British Voyager*, determined the feasibility of one-atmosphere subsea mating, at non-vertical angles.

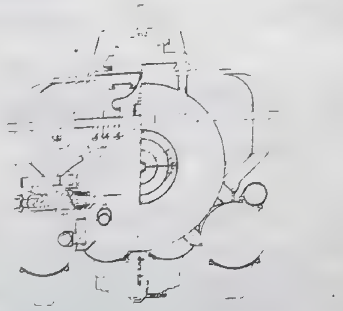
- Using a target plate, inclined at various angles from 0 to 45 degrees and trimmed to an appropriate angle, the submersible was able to mate without difficulty.

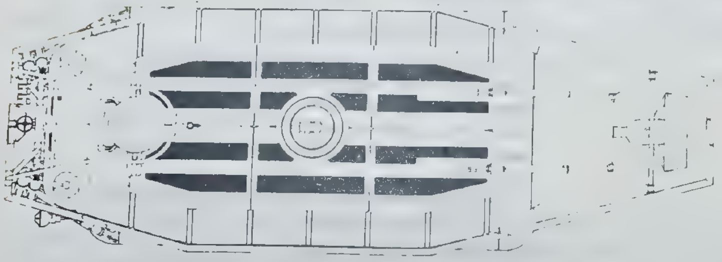
- An alternative mating skirt design, with a 15-degree wedge spoolpiece, will enable one-atmosphere underwater mating at angles to 60 degrees. ✓

Other MTS publications which recently have been released include the *International Safety Standard Guidelines for the Operation of Undersea Vehicles.* This publication resulted from a two-year international study, under the auspices of the MTS Undersea Vehicles Committee, of the current status of undersea vehicle operation and safety. The primary focus of the publication is the actual operation of a submersible and resultant safety considerations. Another recent MTS publication which should be of interest to the diving community, is the *International Diving and Insurance Symposium Proceedings.* This book contains the transcripts of the first international meeting at which divers, contractors, government representatives and insurance specialists came together to discuss the needs and problems of the diving industry. Both publications may be purchased from MTS Headquarters.

Shown below are the drawings and statistics on the MERMAID VI. Construction was begun in 1978 and shallow water trials for MERMAID VI A took place in summer of 1979, with delivery in Oct. 1979. MERMAID VI B is scheduled for completion in summer 1980. MERMAID VI C & D are now under construction. Perhaps Charles will be able to find out to whom delivery was made as he made initial contact. Thanks, Charles.







Principal Particulars

Length (overall):
8,0 m

Width (overall):
2,9 m

Height (overall):
3,2 m

Draught:
2,8 m

Weight in air:
19,500 kg

Payload in addition to full equipment:
1000 kg

Variable buoyancy:
1160 kg

Max. total lift capacity from main and hard ballast system:
2400 kg

Crew:
1 pilot, 1 copilot/diving supervisor,
2– 3 divers (DLO-mode), or
3– 4 passengers (DWT-mode), or
8–10 passengers (SAR-mode)

DLO-diver lockout
DWT-dry or wet transfer
SAR-search & rescue

Performance

Operational depth:
600 m

Lockout depth:
300 m

Operational depth for dry + wet transfer, rescue:
600 m

Speed (surface):
2,5 knots

Submerged (cruise):
1,5 knots

Submerged (max.):
approx. 2,5 knots

Duration at cruise speed (submerged):
10–15 hours

Range (cruise speed):
approx. 15–25 n miles

Life support, total:
620 man hours

Main Machinery Description

Power source:
Lead acid batteries, 420 Ah per cell, 120 Volt, 52 kWh + 24 Volt DC

Motors:
Central 10 kW DC motor, hydraulic pump with variable flow, pressure controlled

Thrusters:
1 main thruster, 450 rpm, dia 750 mm; 8,5 kW, 1 bow thruster + 2 vertical thrusters, all 900 rpm, dia 300 mm; 2,4 kW

Controls:
Continuous remote control of all thrusters (speed + direction) by means of control lever.
Joystick controls for both manipulators.
Push button controls for solenoid valves.

Drain pump:
Two high pressure (60 bar) water pumps, delivery rate at 60 bar up to 70 ltr/min for emptying the mating skirt or hard ballast tanks.

Basic Structure

Main pressure hull:
Three spheres, interconnected by short cylindrical tunnels; pilot compartment, lockout/rescue/transfer compartment, engine compartment.

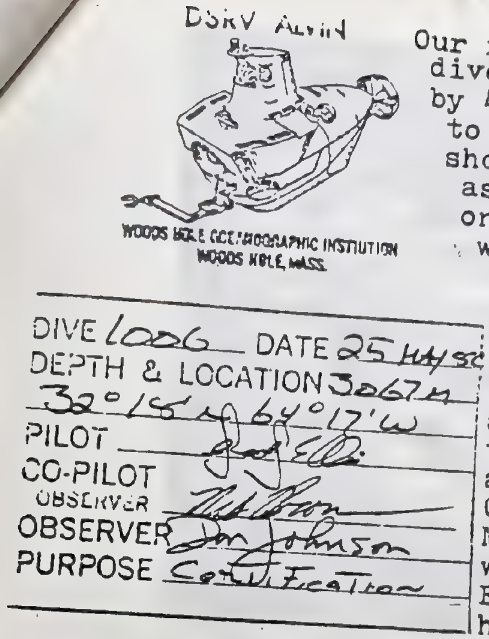
Battery pods:
Two cylindrical battery pods with quick locking hatches

Exostructure:
Hard ballast tanks, gas containers within outer skin, made of fibreglass, protected by steel framework.
Main ballast tanks made of fibreglass, form part of the outer skin.

Handling

Lifting point:
Single lifting hook on central sphere designed for positive locking on the handling system.

BRUKER MEERESTECHNIK GMBH


DSRV ALVIN

WOODS HOLE OCEANOGRAPHIC INSTITUTION
WOODS HOLE, MASS.

DIVE 1006 DATE 25 MAY 80
DEPTH & LOCATION 3067M
32°15'N 64°17'W
PILOT Ellis
CO-PILOT
OBSERVER Brown
OBSERVER Don Johnson
PURPOSE Certification

Our friend ALVIN is diving again after re-certification dives in the Kane Fracture Zone located at about 23-30N by 45-00W. Ed Bland writes that the sub is re-certified to a full 4000 meters (13,100 feet). Ed says that we should have had a cover for a dive to 3700 meters, but as you can see by the reproduction at the left, the one received so far has been for 3067 meters. However, we are grateful for this one and thank the pilots and observer for signing it for us.

After the Kane Fracture Zone series the sub was to be en route on the 13th to Ponta Delgada for the Azores dives.

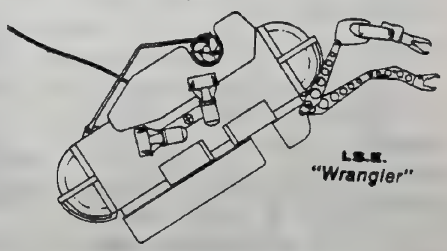
The new name on the cover at the left is Bob Brown, a new pilot just certified by the Navy. Ed notes that ALVIN has had a total of 10 pilots since 1964 - all inactive now except Hollis, Donnelly, and Ellis. Others in the select group are Rainnie, Hammond, McCamis, Wilson, Bland, Shumaker, and Foster. Brown will be number 11. Many thanks for all the info, Ed, and thanks to the other crew members for their help also.

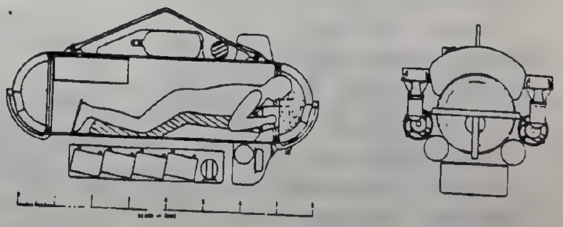
On May 14, 1980, JOHNSON SEA LINK I and II descended to 2020' 6 miles due west of West End, Grand Bahamas Island for ABS certification to 2000'. (see pg. 45, June issue ONE HALF FATHOM.) Until this dive the submersibles, owned and operated by Harbor Branch Foundation, Inc. were certified to 1000'. Due to upcoming research projects, it was necessary to update the range of the submersibles to an operating depth of 2000'. Marshall Flake was piloting JSL II with Bill Goldsby and Richard Roesch in the dive chamber. Tim Askew piloted JSL I with Rob Moore (ABS) as observer and Don Liberatore and Greg Kennedy in the dive chamber.

WRANGLER TETHERED OR UNTETHERED MANNED OR UNMANNED VEHICLE FROM I.S.E.

PRINCIPAL CHARACTERISTICS:

— Dimensions L x W x H	— 8 x 4 x 4.5 feet (26 inch O.D. Hull)
— Weight	— 3,000 lbs.
— Structure	— High Grade Steel (Acrylic optional) — 6061 - T6 Aluminum — SS316 Stainless Steel
— Windows	— 2 Acrylic with 6 inch flats for undistorted close up viewing — Hinged for access
— Dive Depth	— 1200 ft. (2000 ft. and greater optional)
— Propulsion Thrusters	— 2-1¼ Hp Fore/Aft (Larger power optional) — 2-1¼ Hp Vertical — 1-1¼ Hp Lateral
— Speed Control	— Variable SCR
— Payload	— 50 lbs. Mission Payload with a standard fit of two manipulators and a 180 lb. man
— Power Requirements	— 120-0-120 VAC 60 cycle } Tethered — Single Phase 8 KVA } Tethered — 24/120 VDC Battery (Autonomous)
— Hydraulic Power Available	— 150 PSI x ¼ GPM (1 spare valve)
— Buoyancy — Fixed	— Syntactic Foam
— Variable	— 130 lbs. Air Ballast Tank (Typical)
— Ballast Air	— 2-80 SCFX 3000 PSI Air Cylinders
— Vehicle Control — Consoles	— 1 Desk Top Console (Upright console optional) — Control share with the surface if required
— Depth Control	— Manual or Automatic (Not auto in untethered mode)
— Trim	— Variable by battery movement
— Speed and direction	— Single Joystick
— Umbilical length	— 750 ft. sections
— Spare Conductors	— As per customers requirements
— Control	— PCM/C-MOS Technology, Spare Up/Down channels
— Manipulators	— 1-4 Function } Force Feed Back Option 1-7 Function } Force Feed Back Option
— Lighting	— Up to 1500 W (3 lamps)
— T.V. Camera	— Panasonic 1350 A on 180° Pan x 180° Tilt Mount
— Navigation — Compass	— Magnetic (Gyro Option)
— Depth	— Digital xxxx.x ft. or metres
— Pinger	— 27 KHZ emergency location
— Surface Location	— Xenon Flasher
— Sonar	— Optional
— Communication	— Hard wire in tethered mode — 9/27 KHZ UWT in autonomous mode — VHF on surface in autonomous mode
— Life Support—Oxygen	— 80 SCF x 3000 PSI Cylinder externally mounted for emergency use — Small bail out size inside hull for daily use
— CO2 Absorbent	— Sodasorb or Lithiuan Hydroxide for 72 hours extended support
— Emergency	— Closed circuit rebreather


L.S.E.
"Wrangler"

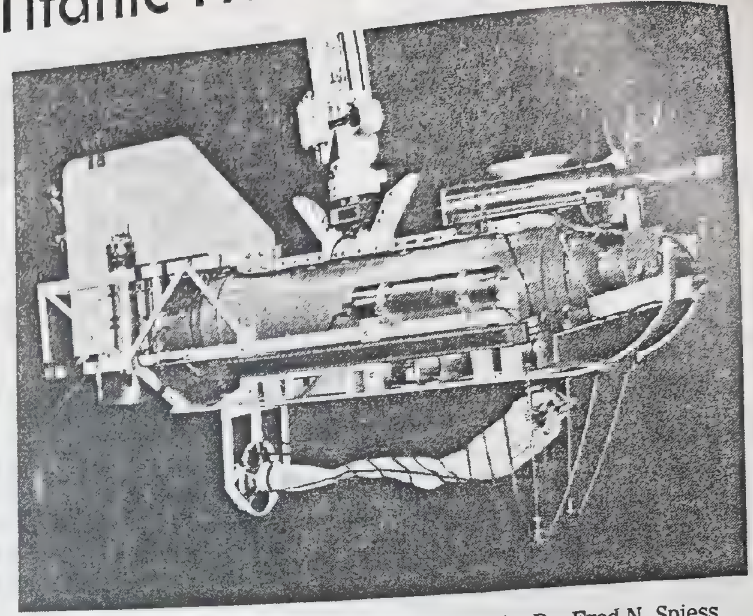


— Options

— 50 cycle power
— Gyro Compass (Sperry CLII)
— 19 inch Rackmount free standing console
— Stereo TV
— Scanning Sonar

— Color T.V.
— Still Camera
— Video Write On
— CP Probe (N.D.T.)
— Handling System (Surface)
— Power Generator

Quest For Titanic Has Many Goals



This is the original Deep Tow vehicle designed by Dr. Fred N. Spiess of Scripps Institution of Oceanography. A modified version of the vehicle, with sophisticated sonar devices, will be used in an attempt to locate the sunken hulk of the Titanic.

By YVONNE BASKIN
Staff Writer, The San Diego Union

A Texas oilman has enlisted the aid of Columbia University and Scripps Institution of Oceanography scientists to launch the most sophisticated search ever for the wreck of the Titantic.

The six-week adventure is scheduled to begin July 12 when the research vessel H.J.W. Fay pulls out of Fort Lauderdale, Fla., heading toward the luxury liner's gravesite 300 miles southeast of Newfoundland.

The Titanic — believed to be "unsinkable" — hit an iceberg on its maiden voyage and sank April 15, 1912, taking more than 1,500 people with it to the ocean floor.

The scientists, including Dr. Fred N. Spiess of Scripps who will direct the underwater survey at sea, will be attempting to gather important information about the ocean floor. They also cite the opportunity to design and use the most advanced new underwater equipment, from sonars to television and navigation systems.

Expedition organizer Jack Grimm of Abilene, head of Grimm Oil Co., also has an interest in the science aspect — he's a geologist himself. There's adventure, money and show business on his mind, too.

"Other people say, 'I wish I had the money to go do that,'" he said in a telephone interview. "I do it and then share it with others.

"I guess one reason I like to do these things is that I also like to see them structured from a business standpoint so that they can finance themselves."

To offset his $2 million to $3 million investment, he already has arranged for a book, magazine serialization, television documentary and movie drama about the search.

"I hope it will finance itself, but it doesn't always work out like that," he said. "It's like drilling a dry hole. But they're not all dry. Sometimes one really pays off."

If the Titanic can be located this summer, Grimm hopes to use the Reynolds Aluminum submersible Aluminaut to salvage artifacts and treasures from the wreck next summer. "We think there may be a large shipment of diamonds in the purser's office, but we haven't confirmed that yet," he said.

Grimm said he has received hundreds of letters from around the world since he announced the project last April, and not one objected to the project.

He said he does not fit the "flamboyant" stereotype of a Texas millionaire, but the Titanic is not his first well-publicized adventure. Others involved searches for the Loch Ness monster and Noah's Ark.

2
THE SAN DIEGO UNION
Tuesday, June 24, 1980

Just last week Grimm announced plans to underwrite creation of the world's largest stone sculpture, a 40-foot-high, 2,000-foot-long tribute to the vanished buffalo herds. It will embellish a limestone mountain he owns at Buffalo Gap, 10 miles south of Abilene.

The scientists take a less colorful approach to the Titanic project. Spiess has called it "an ocean-engineering problem."

The 46,000-ton Titanic sank in 13,000 feet of water. The position of the ship, radioed before it went down, was above a deep-sea chasm large enough to have swallowed the entire wreck, hiding it from sonars mounted on surface ships.

The searchers will use a specially designed, unmanned, sonar-equipped sled, towed underwater 500 feet above the ocean floor and sending out signals in a swath 1½ miles wide.

The sled is a modified version of the Deep Tow vehicle designed by Spiess, which has allowed oceanographers to map the geological structure of the sea bottom in more detail than was possible before. It has been used in manganese-nodule mining studies and in early mapping of the sea bottom along the Galapagos Rift and the East Pacific Rise.

Signals from the sonar devices aboard the sled will be processed by shipboard computers to produce maps of the ocean floor. A magnetometer will determine whether objects detected are metallic or rock.

The sound images should reveal outlines of the sunken ship's hull and details of its structure with a resolution of about 10 feet.

Once the wreck is detected and its position and depth are determined, a vehicle housing television, lights, deep-sea cameras and a navigational transmitter will be lowered to within 10 feet of the hulk.

The region where the Titanic lies

is being studied by marine scientists from a number of institutions in a project called the High Energy Benthic Boundary Layer Experiment (HEBBLE).

The boundary layer is caused by turbulence stirred up when icy currents from the Labrador Sea sweep south along the continental rise off the North American coast. The currents sometimes create huge mud clouds called "abyssal storms."

During the Titanic search, scientists will study these currents and the ocean-bottom features they create, including giant dunes and erosional furrows. Dr. William B. F. Ryan of Columbia's Lamont-Doherty Geological Observatory will be the chief scientist for the Titanic project.

Searchers For Titanic Sail

FORT LAUDERDALE, Fla. (UPI) — A research ship manned by adventure-seekers and loaded with sophisticated equipment began a voyage yesterday to the North Atlantic and a hoped-for rendezvous with the sunken remains of the world's most famous maritime disaster: the ocean liner Titanic.

The ship's first port of call was to be St. George's harbor in Bermuda. Then it will leave for an area of the North Atlantic where the ship's scientists believe the Titanic has rested for 68 years, 2½ miles below the surface.

With a newly developed side-scanning sonar unit built especially for the Titanic search by a Redmond, Wash., firm, the scientists hope to locate the huge wreck. If it's found, a second voyage would be made with submarine equipment.

Besides the adventure of perhaps finding the Titanic, the expedition hopes to salvage some of the riches that went to the bottom with the shipful of social lions from both sides of the Atlantic on the Titanic's maiden voyage in 1912.

The Titanic, billed as the world's first "unsinkable" ship, sank after colliding with an iceberg. Crew and passengers learned too late that the ship carried lifeboats for only about half of them; the Titanic took 1,490 people to a watery grave.

The search for the Titanic is headed by film maker Mike Harris of Tampa, Fla., and Jack Grimm of Abilene, Texas, an oilman who underwrote most of the $2 million cost.

Mr. Michael Harris, the Tampan whose film company will be making the documentary on the TITANIC Expedition. Mr. Harris reports that they will be leaving July 10th to participate. The purpose of this summer's trip will be to locate and photograph the sunken ship, lying in 12,000 feet of water, by using side scan sonar, magnetometers, and transponders. The search area is roughly 30 miles by 30 miles.

The ALUMINAUT is now being overhauled in Jacksonville and will be used in the 1981 expedition. A new, larger viewing port is being installed to facilitate the making of the color documentary that is one of the primary objectives of the expedition. Part of the refit will be 2 new hemispherical end caps. These new end caps will be tested at NSRDC in Annapolis before installation on the ALUMINAUT.

Mr. Art Markel, of Reynold's Aluminum, will be in command on the ALUMINAUT during the 1981 dives.

The FAY will leave Port Everglades sometime during the second week in July and proceed to the Blake Plateau for a practice run of the instrumentation. They will locate and photograph a known ship wreck at the Blake Plateau since these coordinates are well known by the Navy and have been supplied to them. This practice run will test and calibrate all equipment to be used at the TITANIC site, including the SEA MARK I .

...the SEA MARK I is a product of International Submarine Technology, a subsidiary of International Submarine Engineering.

Two or three days after the Blake Plateau run the ship will put into Bermuda and then leave for the target area,where the TITANIC went down,on about July 20th. Mr. Harris states that they hope to "discover" the TITANIC about the first of August.

Famed Oceanographer Isaacs Dies

John D. Isaacs, renowned professor of oceanography at the Scripps Institution of Oceanography, died yesterday of cancer at his Rancho Santa Fe home.

The former director of the University of California's statewide Institute of Marine Resources, Isaacs, 67, was called "a great teacher and inspiration to students and colleagues alike" and "one of the greatest scientists and thinkers of modern times" by friends, associates and former students.

UCSD Chancellor William D. McElroy called Isaacs' death "a tragic loss."

"He was one of the more brilliant people we've ever had at this university," he said, adding, "he's going to be missed by many, many people because of his insights, his ideas and his leadership."

Richard T. Silberman, former director of state finance, San Diego financier and a close friend of Isaacs', called him, "one of the most prolific, original thinkers in the field of oceanographics and an inspiration to hundreds if not thousands of young people because of his special ability to develop latent intellectual energy in people."

Dr. Richard Seymour, a former student of Isaacs' who now is a research associate at Scripps and staff oceanographer for the state Department of Boating and Waterways, said Isaacs was "an amazing man with one of the greatest intellects and broadest curiosity." Seymour said Isaacs always had time "to talk to his students, to stimulate them beyond their abilities" despite how busy was. He said one of Isaacs greatest achievements was to become director of the institute with only a bachelor's degree in civil engineering. "The difficulty in doing that in academia is a tremendous accomplishment in itself," he said.

Isaacs, who came to Scripps in 1948, was instrumental in the establishment of the Foundation for Ocean Research, a non-profit institute set up to provide students an opportunity to study novel scientific ideas without struggling for state and federal grants. He also helped establish the sea grant program, a federally sponsored effort designed to reap the benefits of oceanographic research to apply to the service of mankind.

He conceived ideas that have been used widely in deep-sea drilling, the development of alternate energy sources, and long range weather forecasting.

Interim Head of NOAA Engineering Is NOS's William M. Nicholson

William M. "Mac" Nicholson, director of the Office of Marine Technology of the National Ocean Survey, National Oceanic and Atmospheric Administration (NOAA), is the acting head of NOAA's new engineering organization, which is as yet unnamed. John J. "Jack" Cawley, presently in the NOAA Office of Ocean Engineering, will be acting deputy head.

Nicholson was a career Navy engineering officer, retiring as a Captain after directing the Navy's Deep Submergence Systems Project. Cawley, an electrical engineering instrumentation specialist, was with the Scripps Institution of Oceangraphy and Arthur D. Little, Inc. He designed the instrumentation for the world record depth holding bathyscaph *Trieste*.

One of the segments of NOAA engineering, the Manned Undersea Science and Technology Office (MUS&T), is still in an undetermined status as to its placement in the new organization. Its research and development activities could be placed under the assistant administrator for research and development, while the engineering aspects would go to the new organization.

With personnel actions taking from ten months to a year, the acting heads can be expected to hold their positions for the engineering organization's formative period.

As of Feb. 28, after months of studies and conferences, NOAA determined that all major engineering elements, with the exception of data buoys, would be consolidated. This includes the two principal elements, the Office of Ocean Engineering (OOE) and the Office of Marine Technology (OMT) of the National Ocean Survey. Following a policy statement last November by NOAA Administrator Richard A. Frank that NOAA would take care only of its own ocean engineering needs, accelerated actions and decisions were made.

Those decisions culminated in instructions being set by Deputy Administrator James P. "Bud" Walsh to Assistant Administrator for Oceanic and Atmospheric Services, Dr. Thomas B. Owen, to implement the reorganization. Owen in turn on March 3 directed his deputy Donald P. Martineau to develop the functions, organization, staffing and budget for the new Major Program Element (MPE) that will be placed in Owen's own organization.

Martineau was ordered to form a task team consisting of himself, Holmes Moore, Richard Morse and Cdr. Sigmund Peterson. He was given a deadline of March 24 to produce a proposed title, mission, organizational framework, functions of each organizational element, recommended staffing for each element and position descriptions and grade levels associated with each element.

Also, a Fiscal Year 1981 budget, budget initiatives for 1982, a statement of qualifications for a director, a recruiting announcement for the position, recommendations for physical locations, a timetable for creation of the organization.

Commander John T. Atwell has been appointed commanding officer of the NOAA Ship *Miller Freeman*, based in Seattle, Wash. He has the distinction of being the first NOAA person to qualify as a submersible pilot. He was qualified to operate the *Johnson-Sea-Link* submersible, owned during that period by the Smithsonian Institution, but now owned by Harbor Branch Foundation.

Set. A record depth of 650 meters (2,132 feet) was reached March 14 at the Duke University Medical Center, Durham, N.C., by divers in the Center's hyperbaric chamber complex. It broke the old record of the French firm, COMEX, of 611 meters (2,004 feet), set in 1975. Divers in the experiment were commercial diver Steve Porter, a Commercial Diving Center graduate; Duke medical student William Bell; and physician's assistant Delmar (Bud) Shelton. This experiment was part of the *Atlantis* series begun in 1979. What made this dive different was the unique gas mixture of helium, oxygen and nitrogen. The nitrogen proportion was increased to 10% to produce a narcotic effect, reducing the High Pressure Nervous Syndrome (HPNS) — the "shakes" — that ordinarily would incapacitate the divers. The divers were compressed to 460 meters in 12 hours, 20 minutes beginning March 6, then gradually taken deeper until the 650 meter mark was reached. They stayed there 24 hours, then began slow decompression Mar. 15, emerging from the chambers April 2. Dr. Peter Bennett, professor of anesthesiology at the Center and director of the hyperbaric complex, predicts that, based on the experiment's findings, the eventual working depth of divers may exceed 610 meters (2,000 feet), with decompression time of slightly over one week.

))) **Budget Cuts in Brief.** President Jimmy Carter's efforts to cut spending to balance the Fiscal Year 1981 (FY 81) budget have affected mainly the civil side of marine science and technology. The Navy will suffer mainly from radically increased costs for fuel. That will also affect the operator of the biggest civil research vessel fleet, the National Oceanic and Atmospheric Administration (NOAA). Here are some items. NOAA: $50 million lopped off the Coastal Energy Impact Fund loans, effectively shutting the program off temporarily; $500,000 reduction from underwater research, reducing what formerly was called the Manned Undersea Science & Technology office to $1 million; $1.6 million across the board; and engineering for the National Oceanic Satellite System (NOSS) will suffer some deferment, amount unspecified. National Science Foundation: Ocean Margin Drilling Program engineering design for the ship *Glomar Explorer* cut from $10 million to $5 million; possible research vessel replacement funding unavailable because of fuel costs; ocean sciences reduced $1.8 million from $76 million to $74.2 million; and Deep Sea Drilling Project, reduced $300,000 from $17.3 million to $17 million.

))) **NSF Reveals Plans for Conversion and Use of *Glomar Explorer*.** A ten year, $700 million program of drilling in the sea is being studied by the National Science Foundation (NSF). It envisions conversion of the 188.3 meter long former submarine salvage ship *Glomar Explorer* for the program. The ship will replace the now venerable *Glomar Challenger* whose Deep Sea Drilling Project (DSDP) work proved the theory of continental drift and seafloor spreading. NSF is forming a team of academic and industrial scientists as a first step in what will be called the Ocean Margin Drilling Program (OMD). Eight companies have indicated willingness to participate in the first phase of the program. Foreign countries also may take part. The initial eight companies are: Atlantic Richfield Company, Continental Oil Company, Exxon Corporation, Mobil Oil Corporation, Phillips Petroleum Company, Standard Oil of California, Sunmark Exploration Company and the Union Oil Company of California. Reason for interest of the oil companies is that the ship will be fitted with a riser system to take care of any oil and gas strikes. Thus it may find new, deeper oil reserves. Contracts for conversion of the ship are expected to be awarded next year, depending on funding authorized and appropriated by Congress. The ship will be able to drill in waters from 4,000 to 5,500 meters deep and 6,100 meters into the seafloor.... Meanwhile, Ocean Minerals Company (OMCO) has completed its deep sea mining tests using the ship. It is being returned to the Navy for partial preservation and mooring with the mothball fleet at Suisun Bay up the Sacramento River from San Francisco Bay.

))) **NOAA Diving Role Still Undetermined.** For about two years the Manned Undersea Science and Technology office (MUS&T) of the National Oceanic and Atmospheric Administration (NOAA) has been in limbo. What once were ambitious plans to build a large mobile underwater habitat ran into opposition because of cost. It was first called the Manned Undersea Facility (MUF), a name that didn't last because of the possible dubious interpretation of divers using it, then Oceanlab. In the meantime a comprehensive study — 200 pages — was conducted on NOAA's missions in man-in-the-sea. Now NOAA has split off the research and development part of man-in-the-sea. The remaining office will probably be called NURPO — NOAA Undersea Research Project Office. NOAA will support facilities performing undersea research, but the research operational management will be vested in universities and institutions. Support levels will be determined by the scientific research needs. Funding support for research proposals would be integrated with the facilities needed.....Three proposals are in the final competition for NOAA's undersea research activities. The University of Hawaii wants to use the in-being habitat Aegir and the submersible *Star II*. The University of Southern California wants to use its marine science center on Santa Catalina Island and the nearby giant kelp beds and sandy bottom. A group called SECURE (Southeast Consortium for Underwater Research Efforts), comprised of 25 institutions and led by the University of North Carolina, would perform research at many sites.

UNDERSEA VEHICLES COMMITTEE MEETING
MINUTES
5 May 1980
Houston, Texas

Andre Galerne (International Underwater Contractors) - We have been very active with our submarine the PISCES VI, which we bought exactly one year ago from HYCO. We had a contract on the drillship SEVEN SEAS at that time and we are still on the SEVEN SEAS, God bless it, after being in Canada, Spain, and now in the North Sea. We have conducted more than 100 dives below 3,000 ft. The shallowest has been 3,400 ft. We are diving practically every day at 4,700 ft. in the North Sea. The PISCES boat is living up to its reputation and is doing an excellent job. We are now trying to redesign BEAVER (a lockout sub) to transform it into a PISCES-type vehicle. The MERMAID has also been active. We have had more than 60 diving days with MERMAID so far this year. We now have a job in North Carolina to recover equipment lost on the bottom. The BEAVER is not yet finished, but we hope it will be in the water by the end of this year. In remote controlled equipment we have only one TREC and have used it two times with mixed success. We perhaps lack experience to handle it, but we learn a lesson each time. We have learned, for example, that with remote controlled equipment you must use a ship with a bow thruster. We are very actively involved with one atmosphere diving suits. We have a few of them and are near to making a decision to buy one system before the end of this year.

Frank Busby - Regarding the work you are doing in deep water drilling support. Based on the paper given here last year by HYCO, it seems that the type of work they are doing could be done by a remotely operated vehicle. In fact HYCO attached a cable to PISCES to transmit TV signals back up to the surface to get a real-time appraisal. It seems to be a perfect set up for a large remote vehicle and yet they don't seem to have entered the deep water drilling field - could you comment on this?

Andre Galerne - I think the TV camera and ROV can do the job, but experience shows that with the submarine our speed of re-entry is much faster. For example, we are able to do the re-entry in less than 20 minutes and that I think is a measurable advantage. People from the drilling ship have a tendency to loose equipment. Not long ago they lost a very important piece of equipment which we found at more than 250 ft. from the well, this certainly would be very difficult to find it without a sub. The flexibility of the submarine is something which is important and the fact that we are not tethered is also important because 4 or 5 months ago a pipe broke when we were going down in PISCES. We were at 2,100 ft. and the entire pipe broke and collapsed from the top to the bottom. If we had been in a diving bell or there was an umbilical cord, almost certainly we would have been destroyed. The fact that we were a free-flying submarine helped us from being hit by the pipe. Because any cable underwater or an umbilical cord would have served as a cable guide and the pipe would have fallen on us. It (the umbilical cable) will move you to the point of contact. We feel very strongly any cable coming from the surface can be very dangerous in very deep water because the danger of breaking the drilling string.

Frank Busby - How many feet of pipe was above you?

Andre Galerne - 2,100 feet. In fact the noise was so strong the pilot reported explosions in the engine room. He thought something on the surface had exploded.

Bob Eastaugh (Merpro Ltd.) - Merpro recently purchased the manned vehicle PC 9. Plans for its application were being formulated at the time of the OTC conference. We (Merpro) also look after the P&O diver lockout submarines and maintain them in good class so they are ready to go back in the water whenever they so desire.

Frank Busby - Is P&O doing anything with the MERMAID lockout subs? Are they seeking to sell them or what are their plans, if you know?

Bob Eastaugh - Certainly they look like they might sell them in the very near future. They have several offers going. Whoever gets them gets good submarines in very good order.

Tom Earl (Oceaneering International, Aberdeen) - Oceaneering, as you may realize is in many areas of activity underwater apart from the conventional diving, atmospheric bells and some of the remote controlled vehicles. Probably the area where we have had the most spectacular expansion in the last year has been with the atmospheric diving suits, which I am personally concerned with. We have at this time 19 suits: one of them is used for training and 18 of them are now on operations, or committed to operations. I say atmospheric diving suits using the generic term "ADS" and in this category I include the classical JIMs, the advanced JIMs, which we care to refer to as "SAM", and also the WASPs, which we regard as a mid-water type of JIM. We have 4 WASPs at present. The most activity is on the exploration rigs because that is where the deep water is and where the vehicles have the spectacular cost effectiveness for operators. We are doing most of the classical diving jobs on the drilling rigs. Allowing for the fact that the client must indeed be in the initial planning stages to assist us with the interface. It is absolutely important that any job where an atmospheric diving suit is used that we must have adequate interfacing of the subsea system with the vehicle. The interfacing between the vehicle and the man is taken care of automatically by the man being there. Of all our operations during 1979, probably the most spectacular was one where we demonstrated the ability of the ADS to be logistically mobilized under very fast circumstances. There was an emergency situation which happened in Guana to a conventional diving bell. We were alerted in England on the situation at sometime round about 3 o'clock in the afternoon on Saturday. At 5 o'clock in the afternoon we were asked by the client if we could mobilize to Guana an atmospheric system (ADS). The situation was one where a diving company (it wasn't Oceaneering) had a problem with a bell stuck on the bottom. So at 5 o'clock we heard definitely that we were to mobilize and at 11:15 the next morning (Sunday morning, 18 hours later) we had the suit in the water offshore Guana. As it happened, we didn't get to the bottom on that occassion. We did get all our equipment to Guana by a charter flight, but we were not able to get all the equipment on the helicopter to get to the rig. Because it was an emergency we just took the suits and tacked them up to a telewire and used thru-water communications which all the suits have. We eventually got to the bottom at 3 o'clock in the afternoon. We had a hitch because of the speed with which the operation was carried out. It was a case of making just too much haste, I think, and by that time there were many opinions in any case as to the fate of the poeple who were in the bell. We were just on a confirmatory mission and, as it happened, when the atmospheric suit operator got down there he said that the occupants had actually succumed and there was nothing more that could be done for them. At that stage the only thing the atmospheric suit operator could do was to assist the surface in righting the bell and eventually grappling it to the surface. The job demonstrated that the atmospheric diving suit certainly is living up to its reputation in terms of ability to go on fast logistic mobilizations. The depth of water here was only 480 feet by the way, it wasn't really what we call the realm of the atmospheric suit. It so happened that only a week later they dropped a stack from the same rig and although we had demobilized by that time we remobilized again and this time with all the systems available because it wasn't a human emergency. With everything mobilized and properly rigged, we were able to retrieve the stack and the riser and other odd bits in a three day operation This I think demonstrates that the suit is living up to its expectations in terms of the more obvious advantages of the ADS. With regards to the future, in my view, the atmospheric suit is here now, people understand it and I think more and more people are understanding how to use it. I don't think it is going to be the way we will be diving in 5 years time. I am actually certain that the diverless system will come through, and as Graham Hawkes (OSEL) said this morning, at the moment we are at the point where the problem of interfacing between man and machine are taken care of by the atmospheric suit with the man inside. I think there will always be a place for an atmospheric suit of some form or another. But I think we in the industry must look ahead and talk truthfully about it, we can see that getting man out of the water is really the eventual goal.

Graham Hawkes (OSEL Group, Great Yarmouth) - (A question was asked regarding the relationship between the OSEL Group and HMB Subwork.) We have absolutely nothing to do with HMB other than supply the equipment. I would like to correct perhaps one other impression from this morning. Our (OSEL's) Chairman, Doug Hampson, commented that the future of one atmosphere suits would swing over to remote controlled systems, but what he didn't say what was the timing. And my personal opinion is longer than 5 years. The work that I've done and also my association with many of the universities in the U.K. is showing one aspect of remote controlled vehicles which is quite exciting. And that is, it shows us how complex we are, and that there are very subtle relationships between touch, feel, sound and our senses. It's showing how difficult it is going to be to replace ourselves underwater. While that certainly will happen, I think, perhaps, it is farther off than we think when we talk about dextrous manipulative work. When we talk about eyeballing it is a simpler story.

Our company has built the series II WASP, which is fairly highly developed. We are building a further number of MANTIS vehicles for Oceaneering. By the end of the year we should be up to about 10.

Drew Michel (Taylor Diving) - We are now operating 8 RCV-225's. Two are in operation in the North Sea, one on the SEA MACK barge and I can't recall at the moment which vessel the other one is on. The third is enroute to the North Sea. A fourth is operating in the Gulf of Mexico. Two are on the HONDO platform out on the west coast. Another contractor was out there but they had a little bit of difficulty so we are helping them. There is one that is enroute from New Zealand that has been on a job for two years now and is going to Southeast Asia. The eighth vehicle is back in the lab now in Belle Chasse being fitted with some explosive devices. The main thing that we have been trying to prove with these vehicles is working out. Our goal is to accomplish work tasks with a very small vehicle (RCV-225), and hopefully prove that we don't need large complicated, bulky manipulative vehicles. The latest project with the explosives is that we hope to be able to possibly cut grout lines, guidelines on drill rigs, etc., using explosives and the RCV-225.

Frank Busby - Drew, in some of my conversations with ROV operators, it seems that color TV is moving into that field. Do you have any comments on that, are you using them?

Drew Michel - This is a personal opinion, but we have done a tremendous amount of research on the color TV question and the big problem is there is not a color TV around that is worth a damn. It is that simple. They all require too much light and the resolution is inadequate. While some people are using color TV because the clients require it, the results really aren't that good. If you get up quite close to something, say 2 feet or 3 feet away, with 500 w of light, then you are going to get a good image. But for general maneuverability or overview from flying through or around a structure, there is no worthwhile color TV on the market. If I'm wrong, I wish somebody would show it to me.

Frank Busby - Drew there is another thing I would like you to discuss. A number of the ROV operators I've spoken with recently, in the U.S. and Europe, are quite disturbed by the high cost and less than timely response they are getting from suppliers of remote vehicles. Several opreators have asked me is there anything that the Marine Technology Society or the Undersea Vehicles Committee can do to make the manufacturers of remote vehicles aware that they are disgruntled and that the manufacturers don't seem to be very responsive. Is this a problem with you?

Drew Michel - Yes, it is a problem with me and with everyone and there is only one answer. Neither the Marine Technology Society or any other organization can solve it. The only people who can solve it are the users of the vehicles. And the only way they can protest is to quit buying from them. It is that simple.

I did have a couple of other items. Everyone likes to hear about loosing vehicles. We did loose one last year on the PEMEX blowout. This was a perfect example where an unmanned system, or remote controlled vehicle was the ideal tool. As you know, several divers lost their lives trying to correct the problem. In one instance it was absolutely necessary to go in (to the structure), observe some particular hardware to see if it was in place. A diver couldn't possibly do it without seriously endangering his life and they knew if a remote vehicle went in it would be lost. My operator called me to get permission and I said whatever the client wants, we'll do, as long as he understands that he would have to pay for the vehicle. We knew the vehicle would be destroyed and he agreed to pay for it. So here is the perfrect example where a machine, that we knew was going to cost a couple of hundred thousand, would do the job and probably be destroyed in the process. But it was worth it. The job was finished and with no loss of life.

Harvey Miller (Perry Oceanographics) - In the last year we have delivered the Mobile Diving Unit which is kind of a vertical submarine, some people say, with a lockout chamber in the lower level and the control capsule in the upper level. This is a fairly elaborate machine which is now with our technicians in Scotland. They are completing some of the final installations. We recently shipped PC-1602, the number 2 version, which has proven to be a very reliable 3,000 ft. submersible, along with a diving system, and various other equipment to Saipem. We have also been developing a bigger and, we think, better RECON VI. This is a deeper remote vehicle than we have worked on previously. We are also working on a deeper submersible designated the PC-19, a 10,000 ft. submersible.

Mike McDonnald (International Submarine Engineering, Ltd.) - ISE is continuing to build TRECs and TROVs. The last TROV delivered was to the U.S. Navy. It is for torpedo recovery work and has been doing some salvage work in conjunction with divers on aircraft lost in the northwest. We will be up to TREC number 18 by the end of next month. There is no more TREC number 8. It went in the port side of a bow thruster and came out the starboard side in little pieces off New Zealand. And TROV 9 was lost in Rio down in Brazil. This is about all, any questions?

Frank Busby - How about DART?

Mike McDonnald - The first productions are to be finished and accepted by the client which is Defense Research Establishment in the Vancouver area, the second one will be going to Horton Maritime, it will be a 3,000 ft. DART for use from the AUGUSTE PICCARD. We are planning to build others. (Frank Busby - Are there any plans to construct the WRANGLER submersible?) We hope to be building that this year.

John Manual (Lockheed Ocean Systems) - Although we don't have a great deal of commercial vehicle activity, I can report that our DEEP QUEST submersible, operating out of our San Diego laboratory, is off and on involved in the fuel cell program at United Technologies. The fuel cell is for eventual installation on the DSRVs, which are operating quite actively out of their San Diego base. In addition, we are doing unmanned vehicle work, but most of it is in the mine warfare area. At this time I wish I could tell you more about what we are doing; but it is proprietary. There is a resurgence of activity in that area and it is quite an interesting unmanned vehicle. In the commercial area, Lockheed recently sold Lockheed Petroleum Services to Husky Oil. We have opened up a Houston office because Lockheed Ocean Systems is continuing to do several million dollars a year in offshore systems and services to the offshore industry. So I hope that as the next couple of years come by we will be able to get our vehicle technology and some of our engineering technology together as well.

Jack Bennet (Gulf Maritime Explorations) - (A question was asked regarding Horton Maritime's purchase of the pressure hulls of the French submersible ARGYRONETE.) I won't address that problem because I don't know the answer, except the boat, which is in Marseille, and was uncompleted by the French some years ago, is probably going to be completed in the same locale. It (Horton Maritime Explorations, Ltd.) also owns BEN FRANKLIN which is in Vancouver.

What I am more familiar with is the AUGUSTE PICCARD. Gulf Maritime, my company, operates and markets the PICCARD for the owner Horton Maritime. There have been a few physical and operational changes since our last report here. Physically we are having a large, high capacity manipulator put on the bow This will have a capability of 5,000 lb. lift. The manipulator eliminates the need for the manipulator on our TREC, so we have exchanged the TREC for a DART. Mike McDonnald mentioned that it will be a deep diving DART. It will have, in addition to the black and white video, the Photosea top of the line 35mm camera, with strobe. We have a bow thruster now being installed. We are going to upgrade our computer to a PDP 1134, large capacity. Operationally we are shifting our base of operation from San Diego to the Gulf of Mexico, the first stop being Corpus Cristie where we are going to dock and do a minor overhaul. After that we will start working our way further east. Our long range sights are set on eastern Canada. (Frank Busby - Jack, you are changing a TREC for a DART, can I ask why you are doing that?) Well, the TREC, of course, has an additional capability with the manipulator, we don't need that now that we are soon going to have a manipulator on the bow of the submarine. The DART is higher speed, we can have her modified with a neutrally buoyant umbilical down to 3,000 ft. which is 1,000 ft. further than the boat can go. Her capabilities are more suited to our needs with our new manipulator on the bow.

Maurice Byham (Intersub) - Having got the greatest quantity of submersibles we have to now get the work. This year is going to be a very quiet year, at the moment we have one long term contract on the Mediterrean pipeline. We are assisting with the pipelaying and general inspection work. That seems to be going very well. The first line has been completed now and we had a little celebration a couple of weeks back so we have three lines to lay at the moment, and possibly a fourth line. It also seems there is a possibility of a number of other lines across the Mediterranean, some have been publically announced and some are a little more secret. But overall there is going to be alot more pipelaying generally in the Mediterranean. The other work we are doing involves route surveys for cables across the Messina Straits and on the pipeline for the Casablanca Field. The North Sea at the moment seems very quiet. In fact, we have been working recently on a very interesting and exciting job with a tanker that broke in two in the British Channel where the bow section sank upside down. It was surveyed and found to be leaking in three or four places. So we did an operation for 10 days during which time we were diving three or four times a day. There was a very severe current in 300 ft. of water and we systematically surveyed and then temporarily and permanently blocked the holes so there were no leaks at all. The French, quite naturally, are very sensitive at the moment about leakage from tankers because they have had so many catastrophies on their coast. So that job was completed. Now the recovery of the oil has been awarded to COMEX. They will be starting that job in three months time. In the North Sea we have a limited amount of inspection work, but generally the North Sea has been very quiet this year. In fact, we are still waiting for tenders for work that is supposed to start in about two days time. (Frank Busby - what kind of activities have you been having with your remote vehicles?) We haven't used the CETUS vehicle as yet. We put it in Marseille and are working on it, but we haven't as yet been able to put it out on any contract. The manned vehicles have done very well. We had alot of teething problems with the remote vehicle, as I think all manned vehicle operators have had at some stage of the game. Not the least of which was umbilical problems. Overall they are now sorted out. The biggest problem with that vehicle (TROV) is that we have so many sensors, that trying to get them all working at the same time can be quite challenging. It has finally begun performing well over the last month or so. (Frank Busby - have you completely finalized that entire system of ship, vehicle, instrumentation; essentially a "hands-off" job once the system got moving?) Yes we are there. There is always going to be updates in any company that is operating vehicles like this, and we will start to modify the system based on our experience. You can't say that is is complete in that sense. But overall, yes, it is in the operational stage and we are satisfied with it.

Bob Hittleman (Hydro Products) - (A question was raised regarding the Mine Neutralization Vehicle Program.) We are quite happy with the Navy Mine Neutralization System Program and in particular of what will be of interest to the commercial community. The type of reliability and maintainability programs that are undertaken at Hydro Products for the MNV will have spinoffs in the commercial arena, in terms of increased reliability and maintainability of systems that we build such as our RCV-150s. In fact there is quite an interchange. We like to believe that we were chosen to participate in the Navy's MNV program because of the experience we gained in the commercial world. Now after a major program like that the spinoff will probably be in the other direction: from the government to the commercial.

I would like to say a few words about color TV and present Hydro Product's view. There is a place for color TV in the underwater medium, but it has to be very good in terms of illumination if it is going to be useful as a device for inspection. Color TV requires an awful lot of light the way people are using it today. Hydro Products has some other ideas on how to accomplish color TV in the underwater medium. Possibly at this time next year we will have more to say about it. But Drew (Michel) is quite correct, if it is to be useable it has to be within short ranges because you can't see color very far owing to the absorption characteristics of water. And if you are going to use it on smaller submersibles where power is very precious, you want to get away from a very high powered light. The way we handled the problem is to use color photographic equipment. In fact, if you stop by our booth this year you will see that we have adapted our small RCV-225 to carry the Photosea 35mm camera and strobe light. That meets the criteria we suggested which gets enormously high resolving power with good color films. It uses a strobe light which is quite efficient in terms of producing light.

Last, there is a point that was brought up earlier that I would like to address, because it is one of those areas we are concerned about also. That is the cost of spare parts. We are quite sympathetic to the community, our users/customers, in terms of the cost. We do not believe it is a "ripoff". Spare parts are expensive, we know that. We are looking in two ways to reduce the cost of spares. Number one is to make the equipment more reliable. We have on-going programs they do not move as quickly as one would like. Secondly, this subject is dear to my heart. People don't realize the costs that are involved being able to make things reliable underwater. It is not easy, it is difficult. Alot of resources have to be brought to bear, and it takes time and it takes money. We do spend time and money but these things do not happen quickly. It is not like automobiles or refrigerator production lines running 100,000 units. We have something over 30 of our small RCV-225 systems in the field. We have one

RCV-150 vehicle doing an excellent job now down in Australia. But when you say we build alot of systems (38) that isn't even a pilot production for a refrigerator or stove or anything like that. I guess we are going to have to live with reliability something less than what we are accustomed to in our refrigerator, but we will be getting better as time goes by. We are using our resources to improving that and I know in my conversations with people at Ametek Straza and ISE, it is a common concern. It is not that the manufacturers are not sympathetic, believe me, we are not ripping you off.

Frank Busby - A few months ago one of your people told me of a design Hydro Products was doing for the Royal Navy, for a towed vehicle, are you at liberty to tell us something about that work?

Bob Hittleman - Within a program that the British Admiralty is undertaking they are building a dedicated surface ship called the Sea Bed Operations Vessel (SOV). They plan to have a moonpool on the vessel with a saturated manned diving system. Off the fantail they will have a large M-frame which will be capable of launching both a manned submersible as well as an unmanned system. Hydro Products and Sperry are involved at the present time in the unmanned vehicle system. The vehicle is unique in that is incorporates a "wish list" of what everybody wants to have on a vehicle. The system will operate to a maximum depth of 20,000 feet and may be used as a simple towed survey system or, if the SOV is brought to a complete stop, the vehicle may operate as a free-swimming vehicle by deploying it from a launcher. It will have a manipulator, television cameras, photo cameras, side scan sonar, forward look sonar, altimeter, pressure/depth system, magnetometer, and droppable marker beacons. A short baseline system is tied into the SOV; but it will also have the capability for a long baseline system. I don't believe there is anything available in today's technology which isn't in there. It is a very exciting program that we are really enjoying working on. It is called TUMS: towed unmanned maneuvering system.

Richard Hess (Ametek Straza) - We are also trying to solve the parts problem. We are doing it by trying very hard to build a vehicle that doesn't require spare parts. We have not entirely succeeded. Very quickly I will try to fill you in. Incidentially, I agree with Bob (Hittleman) pretty much and there is not much point repeating it. We have several systems now in the North Sea. We have a system which continues to work on TREASURE SEEKER for North Hydro operated by Oceaneering. Sonarmarine has a system now that is on lease which is doing short term jobs very well. It is a standard vehicle to which they have added a number of additional sensors, cameras, this sort of thing. We just delivered a system for the EKOFISK annual inspection job that is being configured at this time. That system, by the way, was used on the ALEXANDER KIELLAND to cut cables and assist in towing the hotel away from the site. A cutter was installed in the field which was cutting cables up to 2 inches plus in diameter. Some 30 hours of dive time were accumulated. We are now finishing our last system of a production run of eight units which is to be delivered this month to Sonarmarine. This is a highly modified system with various aft looking cameras and forward looking cameras. Just about every camera angle you could possibly want. And we are presently going into production with eight more systems. We are very definitely in the vehicle business and we intend to stay. Our latest product in the vehicle line is what we call SCORPI. We are trying to take advantage of a reliable field-proven system. We are using as many of the SCORPIO subsystems as possible. The multiplex various control systems are being borrowed from SCORPIO. We have a full scale mock-up of this vehicle. It is intended to be a very high speed, powerful work vehicle. We hope to achieve an ability to operate in currents up to perhaps 3.5 to 4 knots, with a fairly good length of umbilical. The unique thing about this inspection vehicle is that it is fully stabilized. It uses six thrusters, three of them in the vertical so it will be fully stabilized for pitch and roll. The vehicle will be dynamically stable. In fact, it could be towed at high speeds with a side scan system onboard. You could then stop hover, fly around to make a close, high-grained bottom inspection. Various sensors will be available. We don't intend to put any form of manipulator on the system initially, but it certainly could accommodate one.

John Pritzlaff (Westinghouse) - I just wanted to give the yearly plug to the Marine Technology International Safety Guideline book. Many of the people attending this meeting worked on it. If you don't have a copy stop by the Marine Technology Booth, they will be happy to take your order.

Joe Vadus (NOAA) - First let me say that it is a real pleasure to see all of my friends again. Last fall in New Orleans Frank announced the availability of his book: Remotely Operated Vehicles. Frank worked under contract to the Office of Ocean Engineering, on a world wide assessment of remotely operated vehicles. I still have a few copies left for those of you who haven't received one. If there is anyone here who would like a copy, please leave your business cards with either me or Frank and we will be glad to provide one for you. The other point I would like to make is regarding some work that I am involved with in NOAA. We are working with NASA on a remotely operated vehicle called DIGITOW. NASA has put in about $2M and NOAA has put in about $200K. It is a completely digital system and one of the key features is the fast digital side looking sonar that we are developing. It has image enhancement capabilities, employing computer programs. We expect to be lab testing in the next couple of months and then going to sea perhaps late summer or early fall. Another project that I am supporting on a rather small scale is at the University of Georgia. It is a towed system that uses an agitator which is towed along to stir up the bottom sediments and it sucks up the sediments while underway. It then deposits the sediment onto a filter paper topside, and performs an elemental analysis using x-ray fluorescence. This fall we are going up to Alaska to conduct further work on the system. Also I would like to mention my involvement in the OTEC program for the last three years. In that time we have spent about $10M for research and development activities for OTEC. I am managing the program at NOAA and I would like to point out an interesting study which is going on in inspection/maintenance/repair for OTEC. I think this will be an opportunity for future work for undersea vehicles. We have some unique problems in that the OTEC system is a massive system which has a cold water pipe that goes down 3,000-4,000 ft. and we will need some manned or unmanned system.

E. Finkle (NOAA) - (A question was raised regarding NOAA's submersible leasing program.) I have an invitation to bid which should be out very shortly for use of a submersible off Alaska, around Marinoff Islands. We have about a 30 day cruise starting in July. We are evaluating proposals to initiate three more programs. One in Hawaii, one off California, and one off the East coast of the United States. These will utilize some existing facilities such as the STAR II and AEGAR which is a 600 ft habitat.

R. Duranton (Societie Eca) - I would like to present some views on the EPAULARD system and also present regards from our mutual friends at CNEXO in Toulon. They are not able to come here because they are now at sea demonstrating the EPAULARD system. Our EPAULARD is a 6,000m autonomous vehicle and we have just completed the first two campaigns. I would like to correct one thing you have in your ROV review. The EPAULARD is not a preprogrammed vehicle. This means you can direct it to go wherever you want while it is submerged. We have automatic course control, but it is not a preprogrammed course. I would like to mention also the PAP 104. We have now delivered 150 vehicles and have orders for 70 more new vehicles. Our new customers will be the Australian Navy, the Malasian Navy and Argentina. Not long ago we demonstrated the vehicle to the Prime Minister of China.

John Howland (U.S. Navy) - First, I would like to introduce CDR Gary Reese who will be the new Chief Staff Officer at Submarine Development Group One, we asked him to come down here this week and meet all of you. We missed coming to the meeting last year, what we would have been able to tell you at that time was that within about 48 hours the DSRV was going to be flown from San Diego to Scotland; this operation came off very well. With inflight refueling someplace over the east coast of the United States we flew to Glascow. We went from Glascow airport to Faslane, this was a joint exercise between the United States and the Royal Navy. A nuclear ballastic submarine served as the mother submarine and a British diesel submarine as the practice sub that bottomed in the Clyde. Then we brought the DSRV over, took it out to sea piggy-backed on the Royal Navy nuclear submarine and transferred the crew from the diesel submarine to the DSRV. The other things that I would mention to you are that in terms of TURTLE and SEA CLIFF, as I think you know, they were built as 6,500 ft. vehicles and we are intending to increase the depth of both of them: TURTLE to 10,000 ft. and SEA CLIFF to 20,000 ft. TURTLE is now in the shipyard at Mare Island and the productive work should be complete in June on the 10,000 ft. modification. We hope to have her at sea in September down to 10,000 ft. We are modifying SEA CLIFF to a 20,000 ft. capability with titanium spheres. I say spheres, in that, we built four hemi-heads and they all came out, so we have enough to make two. They have been forged and are in Mare Island for the final work. Our plans are to have SEA CLIFF at sea in 1982 to 20,000 ft. (Frank Busbv - John, how do you connect the hemispheres by welding?) Yes. The French will bolt their spheres together.

Frank Busby - John, could you comment on the loss of the remote vehicle RUWS?

John Howland - One thing that had not been completed on RUWS, which is a 10-year old project, was to conduct a 20,000 ft. test. We were held up primarily because of the support ship. Initially, we did some work in the shallower depths and then, while the 20,000 ft. dive was underway, there was a failure at 15,000 ft. We are not sure where or what failed on the cable. Primary cable termination (PCT) and the vehicle are now on the bottom at about 15,000 ft. Dr. Speiss with DEEP TOW went out for us a few weeks ago and surveyed the area. We have planned for TRIESTE to assist in recovery, and there is a time slot in June to recover what is left of the RUWS. There are some components we would like back. If we can do some more in terms of location we will send TRIESTE out to pick it up, but that is contingent on getting a better position. (Frank Busby - I was under the impression the vehicle was positively buoyant.) Not the primary cable termination which was still attached. Another problem, this is just speculation, because there were pingers on the vehicle, but the pingers were not heard when we tried to locate them. The feeling is that the vehicle is upside down and that is why the pingers aren't audible. We don't know for certain, but we are still going through the tapes to see if there is anything there. We have all of the cable because it parted at the primary cable termination.

Marshal Flake (Harbor Branch Foundation) - We just completed the annual update on the two Harbor Branch manned submersibles to give them a 2,000 ft. capability and by next week we will be certifying these two boats to 2,000 ft. Part of the sub involves the use of filament reinforced aluminum bottles to replace the standard gas cylinders that were onboard. And these look very good. We were able to increase the payload of the vehicle by about 400 lbs. and able to reduce the crane weight of the vehicle close to 1,000 lbs. which is a fairly significant change. We are also able to increase our gas capability by almost half. It went from somewhere on the order of 3,000cu ft. of gas to over 5,000. Also we will be replacing our one atmosphere mating chamber (cosmic chamber) to 2,000 ft. of water and we will be attempting to go ahead and do a 2,000 ft. mate up with this in a dry transfer. Chris Tieste can update you on our unmanned vehicles.

Chris Tieste (Harbor Branch Foundation) - I have been working with the vehicle called CORD, Cable Observation and Rescue Device. We are working now on our second generation of CORD which has a depth rating of 3,000 ft. At the present time we are operating CORD with probably the smallest station keeping vessel in the world. It is about 28 ft. long and operates with about 2,000 ft. of cable. The CORD II vs the CORD I has been updated to the degree where we are carrying a 70mm camera and a low light level Hydro Products television camera. We also have a side scan and an active scanning obstacle avoidance system and a new 6 function manipulator and storage system. All these systems will be operating in the Bahamas this week and next week. We also will be conducting some tests in the Gulf Stream. At the present time CORD II is a towed system and a remotely operated, free-swimming system. We can operate in approximately 4 knots of surface current, station-keep the vessel, deploy the current deflection rig and operate the vehicle on the bottom and surrounding area with a flexible tether from the current deflection rig. The system can be rejoined and surfaced as a unit, and it is then towed over for recovery from another vessel. Incidently, our R&D area is also working on a zenon arc light which may be of some interest to color television people. At the present time we also have found that a high resolution, low light level system is far more superior to a color system. One reason is that the area in the Gulf Stream off Florida is basically black and white and we don't have the need for color. But also the resolution we desire is only available with black and white at this time. We have developed a 1000 w zenon arc light which is capable of working to 1,000 ft.

Keith Kaulum (Office of Naval Research) - One of my duties is to look out for the Navy's submersible assets, which, in this case, is ALVIN. ALVIN is operated by Woods Hole Institute of Oceanography as a national facility in conjunction with the Navy, National Science Foundation and NOAA. This last year they did some very spectacular scientific investigations using ALVIN off the Galapagos Islands. In spite of the show biz publicity some very important science is going on with ALVIN in exploring the spreading ridges and hot water vents. Recent work in the Gulf of Mexico has found, what are called hot water vents that are about 260°C. Also we are investigating the possibilities of initiating the use of remote vehicles and also a later version of ALVIN somewhere in the future. One of the issues in this study has been the appropriateness of remote vehicles for cruising at depths below 1,000m say 6,000m. The idea of using a tethered vehicle or a Remotely Operated Vehicle with a cable is a question for many people. I would be very interested if any of you have any views you might want to discuss with me regarding the practicability of operating remote vehicles at depths below 1,000m.

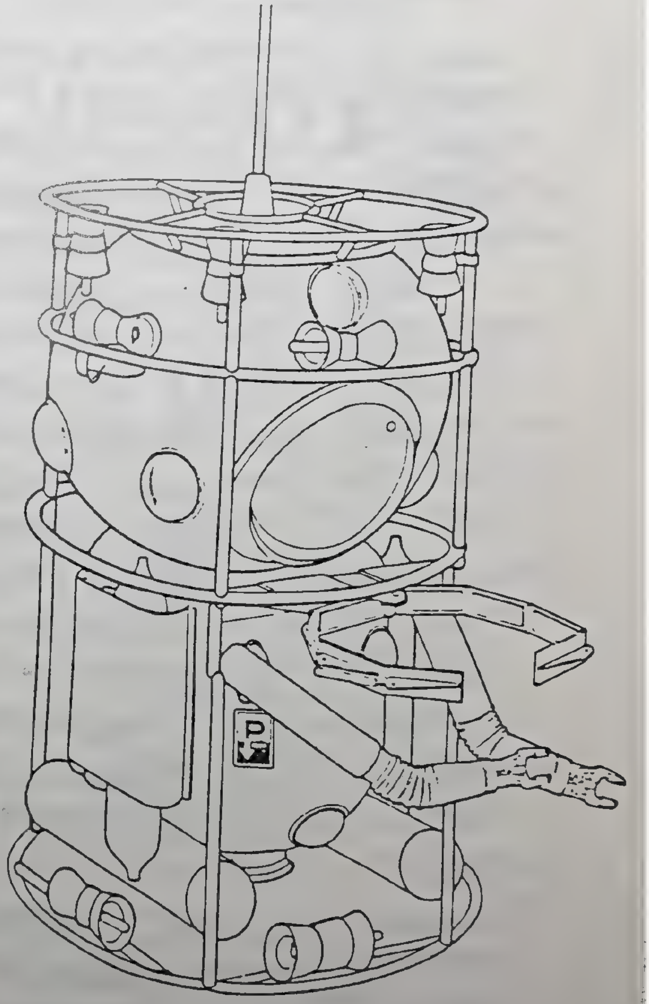
RIVIERA BEACH, FL—Perry Oceanographics, Inc., under contract to Seaforth Maritime Limited, Aberdeen, Scotland, has started the design and construction of a new concept in undersea observation, maintenance, and repair vehicle. This vehicle, a Mobile Diving Unit (MDU), is a major component of a 16-man diving complex being built by Seaforth Maritime for Occidental Petroleum (Caledonia) Ltd. Scheduled for delivery in early 1979, the system will be used aboard Occidental's semisubmersible multifunction support vessel (MSV). Diving consultants for the project are John Haynie, Inc.

The vessel will be used for deep-water maintenance tasks at the Piper and Claymore production platforms and associated pipelines in the northern North Sea.

The Perry MDU, based on both diver lockout submarine and conventional diving chamber technology, will give the divers horizontal mobility, nearly unlimited electrical and hydraulic power at the work site, and a full at-site, surface-monitored instrumentation capability.

The MDU is an 18-ton, 1000-foot depth vehicle capable of maneuvering in any direction. It consists of a one-atmosphere observation chamber (AOC) and three-man submersible decompression chamber (SDC). Mounted above the SDC, the AOC affords an excellent view of the work site through a 31-inch panoramic window. The AOC contains controls, navigation, sonar, and communications systems. It also acts as the operating station for a manipulator and hydraulic tool package. The SDC is fully fitted for three divers equipped for North Sea diving. The compartments are connected by a hatch that may be opened to provide an expanded one-atmosphere work space during extended observation missions.

The MDU also has television, welding, water jet, and nondestructive testing capabilities and is designed for dry transfer to underwater welding habitats.



Mobile Diving Unit (MDU)

FOR IMMEDIATE RELEASE

Norwegian Underwater Institute
P.O. Box 6
5034 Ytre Laksevaag, Norway

1980 Jan 22
For further information contact:
Øystein Martinsen
Head of Institute
(05) 26 16 01

NUI completes diving bell survival test

The Norwegian Underwater Institute, Bergen, announces the successful completion of Project Polar Bear, a test of passive survival equipment for supporting divers in dropped diving bells which have lost their heat and power. Several tragic accidents have demonstrated that the heat loss in a hyperbaric helium atmosphere cannot be tolerated--without proper protection--for more than a few hours.

NUI's researchers, supported by the Petroleum Directorate, Shell Norge and the U.K. Department of Energy, sought to find out if any existing equipment could do the job of protecting the stranded divers, and in fact if passive insulation could do this job at all. The conditions used in the test were extreme: 4 to 6C in a 90% helium atmosphere at 16 bars pressure. It is hard to explain the stress of this exposure to one who has not experienced it. The heat loss under these conditions has been estimated to be equivalent to still air at -100C, colder than any natural temperature on earth. The diver/subjects in the test were quick to agree with this estimate as soon as they entered the test chamber. They are four scientists on the NUI staff or affiliated with NUI: Dr. Stein Tønjum, who is also NUI's medical director and the Polar Bear project leader; Eddie Morild, a biochemist; Jan Onarheim, a physiologist; and Dr. William Dibb, who served as "tender" for the others.

NUI's immediate objective was to get a quick answer. A 2-year NUI study will look into many details of the "lost bell" survival and rescue situation, but that seemed too long to wait for the development of protective equipment that will work. The test was set up by NUI to determine the effectiveness of existing equipment. The investigators gathered a variety of components and assembled several survival "systems." Each system had a breathing device to protect against respiratory heat loss, and in one way or another had to consider the protection of the hands, feet, and head as well as the body.

The first look was at ordinary survival suits, those designed for survival at sea or on a mountain top. It was quickly found, even with proper breathing gear, wooly bear underwear, and high quality mittens, caps and boots, that these suits were of no value in cold helium. They are not designed for such an exposure, and heat loss measured from the instrumented divers backed up their subjective feelings; they were "freezing to death." These tests were terminated in 1-2 hours, and the anticipated useful function was only a few hours more.

Successful results were obtained, however, on two systems designed around sleeping bags. One system built in prototype by an American firm especially for this task put the diver in a bulky vest-hood combination and suspended him in a harness to avoid compressing the insulation of a larger outer bag. The other successful system used a conventional but high quality extreme-exposure Norwegian-made sleeping bag supported on a foam mattress. These two systems maintained the diver for 8-10 hours. The divers were uncomfortable due to cold feet, the cramped position, and the long hours breathing by mask, but they were thermally stable and could have survived the 24 hours which might be needed for rescue. Both of these systems included a cannister for absorption of exhaled carbon dioxide, and both conserved and utilized the heat generated by the absorption reaction. One of these used a simple and inexpensive but surprisingly effective prototype designed by a NUI consultant. It was clearly shown in the experiment that under the conditions of the test, in addition to insulating the body it is essential to save the warmth normally lost in the breath. This must be done to prevent loss of body heat, development of hypothermia, and eventually death.

Øystein Martinsen, NUI's Head of Institute, in welcoming the divers back from their "arctic" adventure and 4-day decompression, made a point about how responsive this project was to the needs of North Sea industry--it was completed in less than two months from its conception, and a detailed report for public distribution will be available in early February.....from:

Norwegian underwater Institute
P.O. Box 6
5034 Ytre Laksevaag (Bergen)
Norway

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

OCTOBER, 1980

Vol. XIV, No. 4. Published by the Deep Submersible Pilots Ass'n

The Deep Submersible Pilots Association was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLATTER may be addressed to:

Robert K. R. Worthington
Editor & President, DSPA
3005 Curie Street
San Diego, CA 92122
(714) 453-1158

or

Donald E. Saner
Secretary, DSPA
4707 Berwick Drive
San Diego, CA 92117
(714) 278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman, DSPA
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

Welcome on board to new Member Doug McKinney, O-in-C of DSV SEA CLIFF, Submarine Developement Group One, San Diego, California.

All hands are enjoined not to wait for 4 November but immediately to indicate your voting preference on the ballots provided and mail them to DSPA Secretary Don Saner or to me. Bear in mind that an amendment to the DSPA Constitutuin is under consideration to extend the term of office to two years. Thanks are due to Jack Bennett and his Nominating Committee of Cameron, Hall, Hoyt, and Keach.

The DSPA letter to ABS regarding low-voltage grounded electrical systems has not elicited a response. Doug Privitt's continuing discussion with ABS (see his letter in this NEWSLETTER) seems to accomplish nothing but easily refuted assertions from ABS as to the hazards involved (when, in fact, they respond at all). It seems to me that ABS is backing into a corner where they have only two honest choices, i.e., to accept the advanced NEKTON's low-voltage grounded system or revoke the certifications (classing) of all presently classed submersibles with either low-voltage grounded systems or higher voltage ungrounded systems. Note that the first three NEKTONS with essentially identical low-voltage grounded systems were ABS classed.

Membership- I regret to report that a number of Members are being stricken from the rolls due to non-payment of dues. In several cases, they have moved without providing forwarding addresses and our correspondence has been returned. Each of these cases of lost, missing, or dilatory Members represents an expense and considerable inconvenience and extra work for DSPA staff. Please provide us promptly with changes of address, payment of dues, or resignation from the DSPA. Be nice, fellows!

Cheers for Jacques Gaudreault! His dues are paid up through 1982.

MARINE TECHNOLOGY '80- Don Saner and Jack Bennett attended the MTS Conference in Washington, D.C., on 6-8 October. As usual, Frank Busby held a meeting of the MTS U ndersea Vehicles Committee; but, as yet, no word has been received regarding the events which transpired. Regular sessions on manned and unmammed submersibles also were scheduled.

SECRETARY'S REPORTS AND NOTICES

DSPA insignia jacket patches and T-shirts are under procurement and should be available at an early date. The suggestinn came from Kevin Parker, and Will Forman is procuring

A "Position Location & Navigation Symposium, sponsored by the IEEE/AES Society in Atlantic City, N.J., 8-11 December, 1980, will have a session on "Undersea Navigation" - not submersible oriented.

The "Second Symposium on Coastal and Ocean Management"will be held at Hollywood, Florida, 17-20 November.

DSPA San Diego Luncheon Meetings

8/11/80

Members Present
Bob Worthington
Don Saner
Don Rosencrantz
John Schiltz

Non-Members Present
Al Smith-DEEP QUEST

Bob Worthington read letters from Whitfield, Parker, and Megow and news items from from "One Half Fathom" and the IUPA Newsletter for discussion. The July DSPA NEWSLETTER and new address lists were distributed.

Don Saner and Al Smith described participation of DEEP QUEST in the movie "Raise the Titanic". As usual, the book excels the movie.

9/12/80

Members Present
Bob Worthington
Don Saner
John Cameron
Jack Bennett
Gary Rees
Dick Hall
Chris Landrum
Ron Rau
John Schiltz
Will Forman
Jerry Shiller

Non-Members Present
Capt. P.R. MacVean-ComSubDevGruOne
Dick Lewis-Lockheed Ocean Lab
Al Smith-DEEP QUEST
Fred Wagner-AUGUSTE PICCARD
Tod Slaughter- " "
Frances Peterson- "

~~Bob Worthington~~ read the report of the Nominating Committee and letters from Privitt, Otter, Chambers, Gaudreault, and Parker. He then introduced Captain MacVean, Commander Submarine Development Group One.

Capt. MacVean gave a brief status report on SEA CLIFF, TURTLE, TRIESTE II, and the two DSRV's, admitting that TURTLE spent a day "in jail" after arrest for being overweight during highway transportation! He agreed to be our guest speaker at the 15 November luncheon and give us a comprehensive report on Development Group activities at that time.

Don Saner reported completion of a 41.9-hr. working/test dive by DEEP QUEST with a 3-man crew, surpassing their previous 32.5-hr. 55 mi. submerged run from San Clemente Island to Pt. Loma. The combined life supportsystem and fuel-cell power unit tests were completely successful. DEEP QUEST made her first dive in 1967!

Jack Bennett discussed PICCARD's overhaul progress, including the 100 % interior paint job--including open junction boxes and other electrical equipment--provided by the Yard. He introduced his new crew member Frances Peterson, an experienced submariner and deep submersible technician.

Will Formanreported on his participation in NEKTON ops in Alaskan waters, involving fishery research. Will agreed to reactivate his investigation and procurement of embroidered DSPA badges and block-printed T-shirts.

Chris Landrum reported that the CANOCEAN operations for Petrobras off the coast of Brazil now consist of maintenance of 6 wells with the future pretty much in limbo.

REPORTS FROM MEMBERS

Dick Otter (7/ /80)
"Truly wish I could report good happenings with the SEA OTTER, but, as the truth has it, it's been rather inactive for a while. as the old saying goes, "it looks good for the future". I, personally, am temporarily sailing as radio officer on a supertanker off of the West Coast, running between Valdez, San Francisco, Long Beach, and Panama. The sun is good, the hurricanes are miserable, and the tropical storms don't even slow us down.--If anyone is interested, I have a rather large stock of LiOH. It is the old lithium hydroxide with the high percentage absorption rate. I assume you have the difference in MIL specs. If not, I'll be happy to supply the same. Roughly, it,s almost two to one. The new is much less dusty but, also, less absorptive. These are the 62-manhour cans, for sale at 465.00 per can or $55.00 for damaged cans. These are the ones that became scarce and cost to $185.00 each."

Jacques Gaudreault (7/30/80)
"I've been meaning to write for quite a while now, but I always found myself tied up in travelling or moving my residence. Since I last wrote I've moved twice and have also left employment with Environment Canada as you have me listed. I've been employed with CAN-DIVE Services, Ltd, for over a year now and am enjoying it very much. Since leaving Environment Canada, I've worked some time in building and running TROV S-9, which as you might know is somewhere on the bottom off the Brazilian coast. Anyway, from there I
[illegible]

moved on to Ocean ARMS-1 off the coast of Spain, but it is now somewhere off the coast of Labrador. Presently, we just completed construction of Ocean ARMS -4's 1500-foot bell (registered under that name , but we all call it TITS-for Tethered Inspection Tool System). At this moment, I'm off in Davis Strait just below Baffin Island on the Drill Ship BEN OCEAN LANCER. Everything is so far going pretty smoothly, and I hope it stays that way.--I've included my new address above and enclosed a cheque for two years membership dues as I don't know whether I'm in arrears or not, as some of my papers were lost during my moves."

Larry Megow (8/4/80)
Critique of the movie "Raise The Titanic"--

By all means, take your children to see the spectacular movie "Raise The Titanic". It will be a breathtaking, thrilling, suspenceful experience. Of special interest to Hahn & Clay is that the hullsfor two of the fourdeep diving submersibles used in this movie-TURTLE and SEA CLIFF- were manufactured by Hahn & Clay back in 1963 and 1964. The two other submersibles in the movie are Lockheed's DEEP QUEST and the STAR FISH. You will be interested to know that the movie cost eight times as much as the \$ 4 million spent by England in 1910-1912 to build the TITANIC. A 3/4" to the foot model of the TITANIC, 55'long, alone cost \$375,000 and \$3.5 million was spent in building a 350' in diameter tank holding nine million gallons of sea water in which to show the underwater scenes. The sunset, sunrise, and ocean scenes are really beautiful, and the scenes in which mechanical equipment is used are exceedingly interesting and, for the most part, factual. Two of the members of the Deep Submersible Pilots Association- Don Keach and Don Walsh- were used as consultants in the movie to be sure all sub scenes were authentic. Yes, go to see the movie "Raise The Titanic". You'll like it.

Mike Staehle (8/5/80)
Nothing new from NOAA. Our office has been reorganized and MUS&T and OOE are no more. The remnants of OCEANLAB are in NOAA R&D. I am now in the Engineering Development Office which is part of the new NOAA Office of Ocean Technology and Engineering Services (OTES) which swallowed the old Office of Ocean Engineering, Manned Undersea Science & Technology Office, Test and Evaluation Lab and Data Buoy Office in Bay St. Louis, LA. The remnants of MUS&T that stayed in R&D still operate the Hydrolab at St. Croix and fund an East Coast DSV cruise annually besides supporting 1/3 of ALVIN's operating expense. I worked with Frank Busby to put out a brief report on the feasiblilty of using a remote vehicle in support of diving operations. With funding such as it is, I don't expect much to happen within NOAA in either DSV's or remote vehicles. I am sending you a copy under separate cover."

Kevin Parker (8/ /80)
"Last I heard of Steve Boulton he was working very closely with Osel of Great Yarmouth, Norfolk, England, with his company, H.M.B. operating WASP's. Perhaps they can help you.--I am supposed to be joining that old faithful, P.C. 9, next month. She is now owned by Merpro Victoria Works Montrose. She is going out with a Thalassa crew and will work from the ex-Vickers ship BRITISH VISCOUNT."

Doug Privitt (8/25/80)

Well, the fight with the American Bureau of Shipping still continues. I would like to thank Will Forman, Larry Shumaker, Bob Worthington, and everyone on the ad hoc committee for their help and support in the grounded system controversy.

It's hard to believe it has been two years since this mess began. In the last letter from ABS we finally received a reason why ABS is denying the use of a low voltage grounded system. Until now the only reason given was that it is the consensus of opinion among the technical committee that it should be ungrounded. Their "technical" reason is that system voltages above 17VDC could cause a person to instinctively react from a shock, causing them to injure themselves or the vehicle by sudden uncontrolled movements. This seems ridiculous to me since the Dept. of Defense MIL STD-454F sets less than 30V as unconditionally safe and up to 70V as safe with proper review.

ABS has the prerogative to set the level anywhere they wish but, once the level is set all vehicles must obey it. ABS has agreed that the probability of a shock in a grounded system is twice that of an ungrounded system. (from our report which is being reviewed for publication in the Marine Technology Society Journal. If anyone is interested we will be glad to send them a copy) But, doubling the system voltage in the ungrounded case achieves the same level of hazard as a grounded system. This means that all ungrounded systems should have system voltages less than 34VDC (2 X 17VDC). Also, since AC voltages are five times more hazardous than DC voltages, ungrounded systems can only use 6.8VAC. As far as I know all vehicles classed by ABS exceed this limit.

It is my opinion that any voltage is acceptable with the proper safety precautions. It is grossly unfair to single out the low voltage grounded system and allow ungrounded systems to operate at any level. Under worst case conditions with a 110VAC system the person [redacted] will be killed from a shock while with a 48VDC system they will only instinctively react. Is this justice?

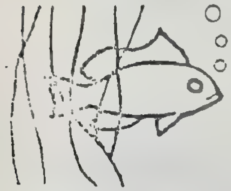
ABS has also finally agreed that any vehicle using a whip antenna uses the hull as a current carrying conductor (which violates the non-grounded rule). But to weasel out they say "it was intended to exclude communication systems from 7.13 by utilizing the wording power, heating, or lighting." I doubt they even realized it was a violation until we brought it up. Under worst case conditions you can be killed from a surface radio.

I would appreciate your comments and suggestions on rectifying the situation. I think something should be done to put ABS back on the right track.

Irene Fager (9/11/80)

Ed Note: The following letter is Irene's reply to a request by an English writer for her collaboration in producing an historical annual review of "subsea production and tie-back activities". She is anxious that we all be assured of her zeal in restricting dissemination of information sent to her and maintaining her non-profit status. It occurred to her, also, that some of our Members might wish to contact Mr. Booth to insure your involvement in such activities as submersibles, diving, and ROV's is not overlooked. Some free advertising may be obtainable.

HABITATS
Charles Simpson
P.O. Box 52923
Houston, Texas
77052



SURFACE SHIPS
Si Steinberg
00 Burnam Road
Columbia, Mo. 65201

Sept. 11, 1980

Mr. Derrick Booth
Subsea Production Annual Review
3210 Marquart
Houston, TX 77027

Dear Mr. Booth,

Thank you for your letter of Sept. 5th. Your project sounds very interesting and I do wish you success in it. However, I am in a very unique situation and I see no way that I can help you.

You see, my information comes to me in personal lette from the submersible pilots and ROV operators. I have never used their information in any profit making endeavor. The ONE HALF FATHOM serves two purposes: 1) It is primarily aimed at collectors of philatelic envelopes which document oceanographic events; and 2) It carries up to date info for the oceanographic community It is a non-profit making enterprise. My staff writers and I do not realize any payment for our work and only do it for the sheer love of the hobby and the sea.

I should note here that I jealously guard my info with a copyright. The only groups which hold a copyright relea from me are; The Deep Submersible Pilots Association, The International Underwater Pilots Association, and the Submersible Safety Committee of the Marine Technology Society. These are all non-profit groups the same as the ONE HALF FATHOM. None of them make any profit from any of my information which they choose to use.

I would feel that I was violating a trust and jeopardizing the integrity of the ONE HALF FATHOM if I were to enter into any agreement with a profit motivated organization.

Also...I can see how I could help you, but for the life of me, I cannot see how you could help us, short of a cash payment, and that I would never do.

cc: Charles Simpson
Si Steinberg
DSPA
IUPA
MTS

Most sincerely,

Irene Fager

Irene Fager

Deep Quest sets records in demonstrating use of fuel cell as prime power source

Oct 80

Lockheed's Deep Quest research submarine heaped record on top of record to complete its assignment for the U.S. Navy — to demonstrate the feasibility of powering small submarines using the fuel cell as an electrical generator.

In successive dives, the Deep Quest stayed down more than 24 hours, then 32 hours, and ultimately 42 hours. The second of the three dives involved a 54.5-mile underwater voyage from San Clemente Island to Point Loma, the entrance to San Diego Harbor.

Besides demonstrating the fuel capabilities, the Deep Quest further displayed the ability of the LMSC-developed potassium super oxide life support system.

The same life support system is destined to be installed in the LMSC-built Deep Submergence Rescue Vehicles (DSRV) and possibly other submarines.

Navy personnel from the Naval Health Research Center at Point Loma continually monitored the health and well-being of the Deep Quest crews during the endurance dives.

30-KW Fuel Cell

Originally developed for Apollo flights to the moon, the 30-kilowatt fuel cell power plant produces electricity by consuming gaseous hydrogen and oxygen without combustion. The by-product is water. The system is completely self-contained and requires no outside power to start or to operate. This small system uses different processes than would be economical for large scale power or for propulsion applications.

The fuel cell replaced one of two sets of batteries on the 50-ton Deep Quest which concluded the first series of operation evaluation dives in 1979.

Although capable of operating to 8,000 feet (2,440m.) beneath the ocean surface, the Deep Quest dived only to 5,000 feet (1,525 m.) the maximum operating depth of the fuel cell container.

The fuel-cell power plant and fuel tanks were developed by United Technologies Power Systems Division, East Hartford, Conn., under separate government contract. The power plant can produce 700 kilowatt-hours of electricity before refueling, nearly three times the amount that the Deep Quest batteries can supply without recharging.

The fuel cell power system is the prime power for propulsion, lights, instrumentation, life support and other electrical requirements on the Deep Quest.

Using battery power, the Deep Quest can be operated for 12 hours at three knots or 18 hours at two knots; the fuel cell tripled the endurance. Deep Quest can provide life support for 72 hours using a life support system installed in 1979 and successfully tested during the first series of fuel cell dives.

Since it began operations in 1967, the Deep Quest has been certified by the Navy, was successfully dived to 8,300 feet off San Diego (at that time a depth record for a freely maneuvering submersible), and successfully recovered flight recorders from two commercial aircraft that ditched in Santa Monica Bay, Calif.

12 Transferred Successfully In Underwater Sub Mating

After a four-year development program, British Oceanics Ltd. has completed a one-atmosphere underwater mating system which uses submersibles to transfer personnel in oil field production and naval rescue operations.

The system incorporates a specially designed mating skirt, fitted to the submersible through a positive lock between the submersible and the pressure hull of a military submarine or subsea installation. Neutrabaric decompression brings the water between the two to atmospheric pressure.

In recent trials, the *L1* submersible operated from the mother ship *British Viking* to transfer personnel from the Royal Navy's submarine *Odin*, in 400 ft of water. Twelve personnel were transferred in four different operations.

Subsequent trials, using the *Taurus A* and *LR5* submersibles, and the mother ship *British Voyager*, determined the feasibility of one-atmosphere subsea mating, at non-vertical angles.

- Using a target plate, inclined at various angles from 0 to 45 degrees and trimmed to an appropriate angle, the submersible was able to mate without difficulty.

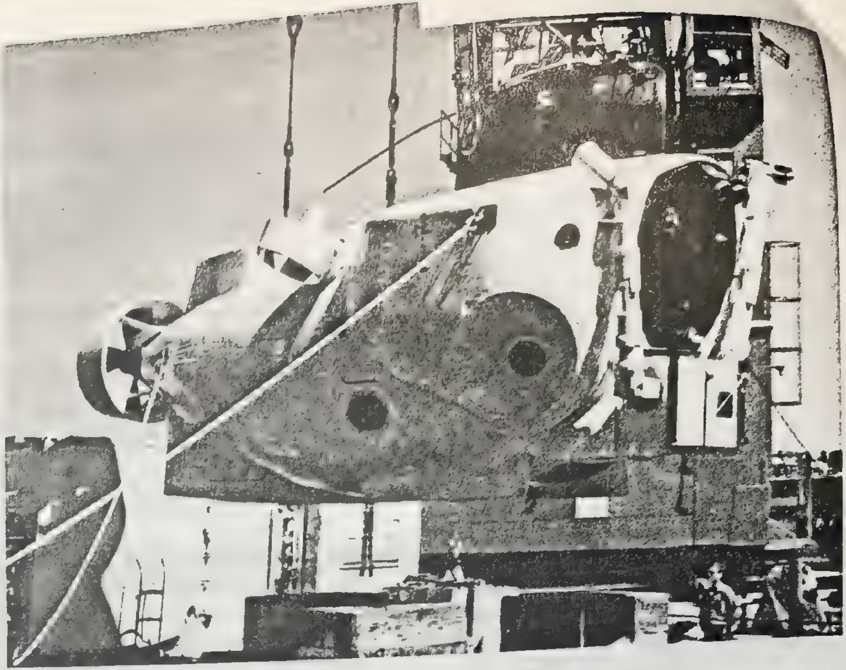
- An alternative mating skirt design, with a 15-degree wedge spoolpiece, will enable one-atmosphere underwater mating at angles to 60 degrees.

HEAT PUMP SYSTEM FOR SUBMERSIBLE

The aim of this particular unit is to minimise the amount of energy required by means of a heat pump. The heat supply is obtained from sea water (through evaporation of refrigerating gas) and the cold supply from the diver's circuit (through condensation of refrigerating gas). The heat pump is immersed in water, fixed to the hull on the outside of the submersible. It is connected to the water circuit to supply the divers', closed circuit hot water suits. The heat pump is designed for 2 divers and their compartment of approximately 4m', in a water temperature of 4°C. The maximum calorific power available is 11 kw, and its total performance coefficient (including the circuit's electrical auxillaries) varies between 2.5 and 4 in a water temperature from 4 to 17°C.

Comex Ind, 287, ch. de la Madrague-Ville,
B.P. 49, 13314 Marseille Cedex 3, France.

Photos show the present configuration of the Navy's Deep Submergence Vehicle *Sea Cliff* for operations to 1980 m. The vehicle will be modified to enable operations to a maximum of 6096 m. Mare Island Naval Shipyard, Vallejo, Cal., is coordinating engineering and fabrication for the modification.



Navy's *Sea Cliff* To Be Modified For Operation At 6,100 Meters

by Darryl Laxo
Ocean Engineering Design Division
Mare Island Naval Shipyard, California

0078

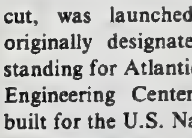
The deep submergence vehicle (DSV) *Sea Cliff*, built by General Dynamics/Electric Boat Division, Groton, Connecticut, was launched in 1968. It was originally designated *Autec II*, *Autec* standing for Atlantic Undersea Test and Engineering Center. The vehicle was built for the U.S. Navy as a result of the successful completion of *Alvin* by the same company.

Sea Cliff and her sister ship *Turtle* were originally designed and built to operate to a depth of 1980 m. They both operate with a crew of three personnel in a 2.1-m-diameter HY 100 sphere. They have an overall length of 7.9 m. Their structure is mainly a free flooding, aluminum frame covered with a fiberglass skin. The ships' systems and components are mounted within this frame. Voids within the hull have been filled with syntactic foam, which provides the vessels' buoyancy.

The Navy's present 6100-m vehicle, the *Trieste II*, is expensive to operate and is not very maneuverable. The Chief of Naval Operations (CNO) has decided to retire *Trieste* and replace her with a more up-to-date, maneuverable, and more economical vehicle. *Sea Cliff* has been chosen as this replacement. CNO has required that *Sea Cliff's* present capabilities be retained after her conversion to the 6100-m depth capability.

Mare Island Naval Shipyard, Vallejo, Cal., was chosen as the design agent for the conversion. Mare Island was directed to coordinate and integrate its design efforts and those of the Naval Ship Research and Development Center (NSRDC), Annapolis. Mare Island was also designated as the overhaul/conversion site.

Vehicle modifications will reflect latest Deep Ocean Technology Program hardware developments and operating experience. Key to the conversion is the installation of a new titanium personnel sphere. Full advantage will be taken of the experience gained during Project Titanus which produced *Alvin's* new 3660-m capability titanium sphere. Other significant changes will include: an increase in length of the vehicle by 1.2 m to accommodate the increase in weight and buoyancy, a new sea water variable ballast system, a new descent/ascent weight dropper system, new 6100 m rated syntactic foam, oil-filled electrical cables and an increased life support capability. All other vehicle systems are to be evaluated and modified as needed to function at the new depth.



Darryl E. Laxo holds a B. S. degree in mechanical engineering from Sacramento State Colege, and is a registered professional mechanical engineer in California. He has been associated with the Deep Submergence Vehicle program at Mare Island Naval Shipyard for more than a decade.

Systems

Life Support

System capacity must be increased because of the additional time required to travel from the surface to the new operating depth. In addition to this requirement, Naval Sea Systems Command (NAVSEA), Washington, D.C., has authorized an increase in life support capacity for emergency purposes. Experience with the *Johnson Sea Link* and other DSV emergencies has indicated a need for as much as 72 hours to mount and accomplish a rescue of a DSV. Thus *Sea Cliff* will be provided with adequate oxygen and CO_2 to support its three crewmen for at least 72 hours.

The existing oxygen system will be removed and replaced by a more compact system. In the new system, three oxygen supply flasks will be separately valved but interconnected. Main and emergency breathing system (EBS) oxygen supply control panels will also be interconnected through appropriate valves. This arrangement will provide full redundancy. The entire oxygen supply will be available through either the main or emergency breathing systems.

The main CO_2 scrubber system will be modified to install a redundant blower. The blower circulates the cabin atmosphere through the LiOH canister. Both blowers will be powered from two alternate electrical power sources. Adequate spare canisters will be carried for the full 72 hour requirement. These canisters will be interchangeable with the EBS CO_2 scrubber. This interchangeability will permit full-time support from either system.

Replaceability of the canister in the EBS CO_2 scrubber required the design and manufacture of a scrubber isolation valve. This valve will isolate the EBS

(Continued on page 30)

OCT 80

manifold from the cabin atmosphere during exchange of the canisters. It will permit the crew to continue to breathe during the exchange. Due to a potential buildup of CO^2 within the EBS loop during the exchange, the exchange must be accomplished quite rapidly. This requires the canister mounting to incorporate a quick release fastener. A CO^2 level sensor in the EBS manifold will warn of excessive CO^2 buildup. These modifications have all been designed and are in the process of being manufactured and tested.

Hydraulic

The hydraulic system consists of an oil-filled, pressure-compensated canister which serves as a reservoir and in which are mounted system control valves and the main and auxiliary pumps. The electric motors which drive the pumps are mounted on the canister. The system is rated at 3000 psi and up to 4.5 gpm with both pumps running, i.e. 1.3 gpm from the main pump and 3.2 gpm from the auxiliary pump.

This system powers the stern propulsion and steering system, mercury trim system, selective weight release system and the manipulators. It will be modified to provide hydraulic pilot pressure to the new seawater variable ballast system valves. It will also be modified to permit direct operation of the trim systems. The last two systems are described elsewhere in this paper.

Studies have been conducted to determine the need for a lower viscosity oil and the adequacy of system seals at the new depth. As a result of the first of these studies a low viscosity oil (1 to 5 centistoke) will be used in lieu of the present MIL-H5606. The second study showed that in most cases the present O-ring seals are adequate, but the flat gaskets used on the canister access plates are not. These flat gaskets will be replaced with O-ring type gaskets. The O-ring type gaskets will permit the precompression required to counteract the effects of the ambient pressure at 6100 m.

Steering and Propulsion

The hydraulically powered stern propulsion and steering system and the electrically powered side pod propulsion and steering units do not require any mechanical modifications for operation at 6100 m.

The stern unit consists of a high speed, low torque hydraulic motor driving the shrouded propeller through an 80:1 reduction harmonic drive. Steering is accomplished by training the propeller and its shroud through 100 degrees (50 degrees to port and 50 degrees to starboard). Training is by a hydraulic cylinder.

The side pod units are powered by reversible electric motors. The shrouded propellers are trainable thru 360 degrees. This versatility permits the vehicle to hover, travel forward or backward, to thrust upward or downward and to turn within its own length. All of this adds up to a very high degree of maneuverability

Trim

The trim system presently uses a low pressure pump-motor assembly to move mercury from one end of the vehicle to the other to establish a desired trim angle. The 272 kg of mercury obtains an angle of 14.5° up or down.

The modifications to this system will remove the oil filled, pressure compensated canister and its contents (the pump motor assembly, a self-pressurizing reservoir and the solenoid-operated directional control valves), and replace it with a solenoid operated directional valve assembly which can be mounted directly in seawater. This will result in a much lighter, simpler and more easily maintained system.

Main Ballast Blow

Except for the high pressure air (HPA) flask and charging connection valve the present main ballast blow system is adequate for the new depth. It is only operated at the surface to provide additional freeboard, and thus does not need to operate at 6100 m. A flask isolation valve will be installed to allow maintenance work on the remainder of the system while the flask is charged.

The steel HPA flask will be replaced with a titanium flask to reduce weight. Also, because the present thick wall piping must be disturbed to replace the flask and charging valve and to install the flask isolation valve, it will be replaced with titanium tubing to further reduce weight.

Variable Ballast

The variable ballast system permits fine tuning of the vehicle buoyancy to effect a hover condition or to alter the ascent/descent rate or vehicle payload.

The existing oil transfer type variable ballast system will be replaced in its entirety with a seawater transfer type system. The existing two rubber bladders and four steel hard tanks will be replaced with two titanium hard tanks. The present hydraulically driven pump will be replaced with an electrically driven pump. The heavy, thick walled pipe will be replaced with titanium tubing. The solenoid-operated directional valves are to be replaced with hydraulic piloted valves. The development of a new pump was necessary because a 10,000 psi seawater pump just did not exist.

The new system and pump were designed by NSRDC, which is also manufacturing the pump. NSRDC will provide the pump/motor/valve assembly to Mare Island for installation.

Selective Weight Dropper

The selective weight dropper system permits a total load of 272 kg of steel plates to be released in 9 kg increments for a coarse control of vehicle buoyancy. The system was designed by Mare Island and built and installed by Naval Ocean Systems Center (NOSC), San Diego. No modifications are required for this system to operate at 6100 m.

Descent/Ascent Weight Dropper

The descent/ascent weight dropper system is being designed by Mare Island. This system will permit the vehicle to be loaded with up to 907 kg of additional weight. This weight is necessary to optimize the vehicle's descent and ascent rates and avoid the need to expend battery power getting down to or returning from the extreme operating depth. Once at the operating depth, 544 kg of descent weight will be released. When ready to return to the surface the remaining 363 kg of ascent weight will be released.

The system will consist of two sets of weight racks, one set of five racks on each side of the vehicle. The racks will be loaded with up to 91 kg each of expendable weight. The weights in three racks on each side will be released by a solenoid and linkage mechanism for the descent weight. Similarly, the remaining two racks will handle the ascent weights.

Piping

Most existing piping will be retained where no system modifications are required. Most systems are impacted by the new 1.2-m section being added. This requires installation of in-kind interconnecting pipes.

For those systems being modified, thinner wall tubing will be substituted for the present thick wall pipes. This will result in a considerable weight savings. To reduce weight as much as possible most of the new tubing will be titanium.

NSRDC is conducting tests to verify the acceptability of titanium tubing and swage type fittings for use under these extreme pressure conditions. Results to date appear promising. As a further verification, all piping subject to ambient pressure will be hydrostatically tested internally and, if necessary for certification, externally.

Valves

All solenoid-operated valves which will be subjected to ambient pressure are to be operationally tested in a pressure tank at the equivalent of 6100 m of seawater pressure. Those which form a pressure boundary to a floodable void, whether solenoid- or manually-operated, will also be externally pressurized to 1.5 times the operating depth to satisfy certification requirements.

Compensating System

The pressure compensating system will be modified by eliminating the compensators which are no longer required and replacing those which are undersized with units of adequate capacity.

Manipulator

The existing manipulators are adequate for use at the increased depth. No modifications are necessary.

Emergency Release

Several systems on the vehicle are provided with a jettison capability in case of entanglement or other emergency. The existing solenoid and linkage release device for the batteries is adequate. No modifications are necessary to operate at the increased depth.

The manipulator emergency release guillotines must be replaced with units capable of operating at 6100 m.

The selective weight dropper emergency release explosive bolt was designed for use at 6100 m so no modifications are needed.

The descent/ascent weight dropper is being designed for emergency release by explosive bolt. The same type of bolt as used for the selective weight dropper will be used. This will reduce logistics, maintenance and certification problems.

Present Status

As of this writing, most of the mechanical design has been completed and hardware procurement has started. Some fabrication is in process. Test documents and technical manuals and other software are being prepared.

The vehicle availability for final conversion is scheduled for 1982 at Mare Island. The actual accomplishment will be keyed to completion of the new titanium personnel sphere. All components and systems will be subjected to an extensive test program which will culminate with a manned certification dive to 6100 m to prove the vehicle's abilities. The Mare Island Naval Shipyard will coordinate engineering and component fabrication throughout the modification. ☐

Memoranda concerning safe and unsafe diving practices in UK waters are issued by the Chief Inspector of Diving, Petroleum Engineering Division, Department of Energy.

MEMO NO 3/1980—UNDERWATER ELECTRICAL SAFETY

The Department of Energy is sponsoring the Electrical Research Association in authorship of a Code of Practice for the safe use of electrical equipment underwater.

It is expected that the first issue of the Code will be published early in 1981.

In the meantime attention is drawn to the existence of a report made for the Construction Industry Research and Information Association (CIRIA)—the Underwater Engineering Group—by the Electrical Research Association.

That report—No UR14—"Underwater Electrical Safety—some guidance on protection against shock" is considered by the Department of Energy to be amongst the best guidance available today on the subject.

Organisations and individuals are recommended to make use of the document until such time as the new Code is published.

Further information may be obtained from:

1. Mr B B Moore
   Principal Electrical Inspector
   Petroleum Engineering Division
   Department of Energy
   Thames House South
   SW1P 4QJ
2. Mr R W Barrett
   CIRIA Underwater Engineering Group
   6 Storey's Gate
   London
   SW1P 3AV
3. Mr M Bradford
   Electrical Research Association Limited
   Leatherhead
   Surrey

MEMO NO 4/1980—LOST DIVING BELL EMERGENCY

An extract from the latest draft of a new diving regulations state that "a diving bell shall be provided with means by which, in the event of any emergency, it can be rapidly located by through water signals from the stricken bell and the lives of the trapped persons can be sustained for at least 24 hours."

As a result of an open meeting with the diving industry and other interested parties the Association of Offshore Diving Contractors issued a statement along the following lines: "all diving bells shall be fitted with a sonar beacon (pinger) and all support vessels shall carry a receiver system working at a frequency of 37.5 kilohertz and this system shall also include a receiver which can be used by the diver for final relocation.

If contractors wish to fit a transponder system then this shall be in addition to the pinger system and not as an alternative to it".

The Department of Energy Diving Inspectorate support the choice of 37.5 kilohertz as the emergency sonar beacon frequency.

Testing a One-Man Yellow Submarine

A prototype of a one-man submersible last summer underwent certification tests at the David W. Taylor Naval Ship Research and Development Center, Annapolis, Md., Laboratory. The K-600 submarine was put through a series of both manned and unmanned tests in the Lab's Deep Ocean Pressure Tank. This high pressure test chamber can simulate the pressures of the ocean environment to a depth of more than five miles (8,321 m).

During the unmanned test, the 4.3 m yellow submarine was initially tested at 274 m. The submersible was later manned by its designer/builder Captain George W. Kittredge, USN (Ret.) and tested in a simulated ocean environment at a depth of 183 m. This marked only the fourth time that a manned simulated dive has taken place at the lab. The tests were witnessed by officials from Lloyds Register of Shipping and Det Norske Veritas, and results were forwarded to those firms for final evaluation.

The 2041 kg submersible was developed by Kittredge Industries Inc., Warren, Maine, under contract to A. S. Sub Service Ltd. of Oslo, Norway. According to Robert Hartnett, the general manager of the Norwegian firm, the vessel is designed to serve a multitude of purposes, including undersea exploration, inspection and salvage operations. It can operate as a launch and recovery vehicle as well as a system that enables an underwater engineer to carry out his work in a safe, one-atmosphere environment.

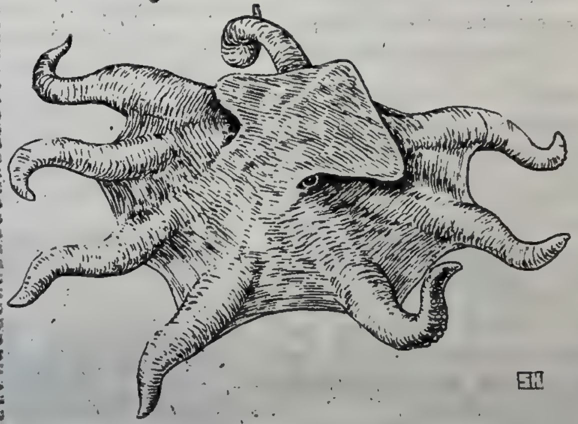
Captain Kittredge is a Naval Academy graduate. During 22 years in the Navy he commanded a submarine division.

The standard Kittredge sub is painted yellow, primarily for high underwater visibility. Because of its many functions, his one-man submersible has often been called the "jeep of the deep", Kittredge noted.

The high pressure chamber in which the K-600 was tested is part of the Navy Lab's Deep Ocean Pressure Tank Facility. Since 1971, it has often been used to evaluate deep ocean equipment such as the pressure hull of the Deep Submergence Rescue Vehicle, undersea mining machinery and electrical equipment. The primary benefit of chamber testing is cost savings and safety. Although the facility is basically designed to test naval undersea equipment, government agencies, military contractors, educational institutions and industrial establishments are also eligible to utilize the chamber, at a cost to the user. □

a PURPLE OCTOPUS

Cirroteuthis glacialis **The Ocean World**



This small octopus was first collected on the famous *Discovery* expedition (1925-27) in Antarctic waters. The color on the upper side is lilac-purple; underneath, it is red at the center, shading to deep blue-purple at the edges.

Long-endurance sub makes ready

Deam W Given reports from San Diego where the big, lavishly-equipped submarine, *Auguste Piccard*, has been fitting-out and testing. The operator claims she will be able to take on just about any offshore, deep water task

SINCE early last year the submarine, *Auguste Piccard*, has been in San Diego undergoing final equipment installation and tests designed to make her the most capable, self-contained underwater work and survey vessel presently available in the commercial offshore world.

Auguste Piccard has an operational depth of 635m (2083ft) (ABS certified), and is now fitted with a large seven-motion manipulator mounted on a bow frame, which also supports a coring device and a low-light television camera with pan and tilt. On her starboard deck she sports an open mesh basket which contains an unmanned vehicle equipped with both TV camera and three-motion manipulator.

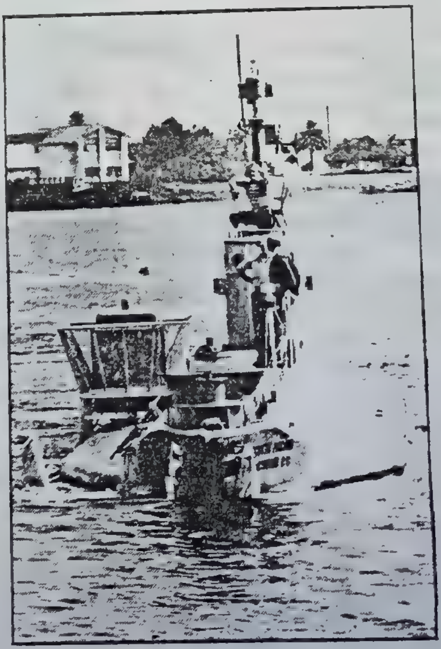
Other survey and scientific gear includes side-scan sonar, narrow beam digital seismic sounder, high resolution boomer seismic systems, conductivity, temperature and pressure instrumentation, acoustic positioning equipment (with up to 16 transponders and relay transponder capability), and video recorders. Completing the fit, there is a PDP 11/10 computer providing real-time enhanced positioning, plotting and survey data logging and off-line data processing and presentation.

'We are just about capable of doing most any underwater project within outer continental shelf limits that the offshore market may require,' claims Tod Slaughter, a former Royal Navy submarine commanding officer and now captain of the *Auguste Piccard*. This sober and characteristically British understatement is rephrased by a more direct American observer: 'Hell, let's face it, this boat is just plain loaded for bear.'

Bears are an unlikely commodity beneath the sea, but as the skipper says: 'This submarine can take on most any job within its depth limitations.' Offshore energy service applications appear to offer the best opportunity for long-term productive employment. Nonetheless, the *Auguste Piccard* can engage in many subsea activities ranging from scientific survey to marine archaeology. In addition, a large double keel for soft, virtually unfelt bottoming, allows sea bottom measurement of dynamic activities and visual observation through port, starboard and bow viewports.

The *Auguste Piccard* originally had 40 viewports arranged on the sides of the hull. Several have now been used as convenient hull penetrators for the boat's extensive underwater acoustics suite, but a magical view of undersea life can be seen by onboard observers when ambient lighting conditions are right.

The submarine was designed by Dr Jacques Piccard for the 1964 Swiss National Exhibition and named for his famous father. Auguste designed the deep diving bathysphere, *Trieste*, which carried son Jacques and others to the record depth of 10 912m (35 800ft) in the Marianas Trench 20 years ago. With such grand heritage, the *Auguste Piccard* spent the first 15 months of her life as a tourist submarine on Lake Geneva, Switzerland, carrying 30 000 passengers during 1100 dives. Fortunately, Jacques designed the vessel for greater than the 245m (800ft) capability needed for that mission and after a couple of years unused and unwanted, she was purchased in 1970 Horton Maritime Explorations, Nor Vancouver, BC, Canada. In 1975, following several years of productive scientific work in her original configuration, the *Auguste Piccard* entered an extensive engineering redesign and conversion phase.



'Auguste Piccard' is under charter to GULMAR which has been responsible for the conversion and refit. Despite the fall in demand for manned submarine services over the past few years the company has high hopes for the vessel. Photograph by Bill Powers

The current San Diego operations are for final equipment installation, testing and demonstration. Next stop is expected to be the Gulf of Mexico via the Panama Canal or the North Sea if preliminary client interest materialises into solid contracts. The submarine is capable of making an ocean crossing.

Endurance

Perhaps the most impressive feature of this undersea craft is endurance. With a total life support capability of 90 man days, (ie, ten people could remain submerged for nine days), the *Auguste Piccard* can remain submerged while underway on battery for 12-15 hours or several days while in an observation mode with just intermittent movement. Normal operations are conducted with a crew of six or seven and up to four observers can also be embarked quite comfortably in this 28.5m (93.5ft) long submarine. There are six bunks and a well-stocked stainless steel galley. But unlike other submarines that fly the Canadian flag, the *Auguste Piccard* is dry.

The submarine is easily controlled while submerged from the diving station by the captain or his mate. There is a forward looking Straza CTFM sonar mounted on the bow and safety equipment also includes two underwater telephones and periscope TV.

The small unmanned TREC vehicle provides an additional safety measure as well as a valuable means of stand-off survey, inspection and light work. Use of TREC enables the *Auguste Piccard* to hover or bottom at a safe distance (60-75m) away from a rig or other work target while the situation and work problem is determined remotely onboard. The TREC operator can also swing the vehicle around for a good look at the submarine and her immediate surroundings. For example, when a bottom operation is planned, TREC provides an advance view of the resting place.

The *Auguste Piccard* is under charter to Gulf Maritime Explorations (GULMAR) which has conducted the submarine's extensive conversion and refit and will operate her in the offshore market. GULMAR officials state that highly competitive rates have been established and they are anxious to take on long-term, challenging undersea tasks. While the demand for manned submarine services has diminished sharply over the past few years, it is not likely that a vessel as capable as the *Auguste Piccard* will remain idle for long. □

SPIDER READY TO DIVE INTO NORTH SEA

The first two Spiders (One-Man Atmospheric Submersible) have now completed their safety tests at Slingsby Engineering and are being sold to Wharton Williams in Aberdeen. The first was delivered in mid-December, and both should be available for use in the North Sea 1980 diving season.

Rick Wharton of 2W attributes the one-year delay in the production of the two suits to the hiatus when Vickers sold its Slingsby operation, and to a greatly extended testing and safety programme, supervised by Rick Wharton, when his company bought a minority interest in Slingsby and he became chairman of the board.

'By comparison with other ADS suits (Atmospheric Diving Suit), the Spider sets completely new standards of safety', Wharton told *OE*. 'If the hydraulic arm locks, for example, the pilot can shed it like a claw.'

Spider has a 72-hour independent life support system, compared with 20 hours for Jim, 36 hours for Wasp, and 16 hours for Mantis (40 hours using face mask). Unlike Jim, Spider has a full mid-water (floating) capability and is not restricted to working on the seabed.

Wharton Williams is in the final stages of negotiating contracts for Spider in the North Sea in 1980; once the first two have paid their way, the company expects to increase the size of its fleet.

Spider's main competitor, Jim, manufactured by Underwater Marine Engineering (UMEL), and marketed by Oceaneering, differs from it in having a cast magnesium alloy body, 19mm thick with free standing legs. it has fluid-supported articulated joints.

OMAS has a solid base without articulated legs. It is constructed from glass fibre reinforced plastics, permitting use at 600m, 150m deeper than the maximum allowed for Jim suits. Although developed rather slowly by comparison with Jim and comparable suits such as Wasp and Mantis, some industry sources rate Spider as 'probably the soundest of all of them'.

Good as the Spider system is, however, it has a long way to go to make up the work experience already gained by Jim and its self-propelled sister, Wasp, which is manufactured by OSEL and distributed by Oceaneering.

Oceaneering operates a fleet of 12 Jim suits and first used them commercially in 1974 in the North Sea. Since then Jim has made 'hundreds of dives'. In 1978 it was used for 22 dives giving drilling support to the *Sedco 703* operating for BP/Aran offshore Ireland in 365m water depth.

This is close to its deepest dive to date in 440m offshore Spain in 1976. In April of the same year, Jim made a series of dives in the Canadian Arctic, where successful hydraulic connections were made to bop stack in depths of 275m. On the North-West Shelf, Australia, two Jim suits have been in 'almost continuous operation'.

Wasp, classified to a depth of 600m, is now being used to support drilling operations offshore Brazil in waters of 120m. Mantis, similar to the Wasp and also manufactured by Offshore Submersibles, looks more like a small manned submersible than a diving suit.

It has slightly less independent power (30 as compared to 40 minutes of full thrust on the Wasp) but has eight thrusters, hand and foot controlled, four horizontal, four vertical, while later models of Wasp have only four thrusters, two in each plane.

The advantage of 'anthropomorphic' (man-like) atmospheric diving suits over conventional manned submersibles is that the ADS is smaller, lighter and cheaper. Size and weight is important both on the platform/rig base, and in operating conditions where maintenance jobs often have to be done in a very restricted space.

The ADS is preferable, in theory, to saturation diving, because the operator works at atmospheric pressure within the suit, and does not need to undergo a lengthy and occasionally dangerous decompression process.

Divers, however, are sometimes wary of them, despite an unblemished safety record. 'I can think of few more unpleasant deaths than being caught in a leaking ADS', one diver told *OE*. Experienced divers are used to the mobility of saturation diving despite the dangers of decompression, and are not always willing to exchange it for the advantages of an ADS.

As more suits become available, more experienced ADS 'pilots' should also become available, and if the safety record continues to be excellent, the use of saturation divers could ultimately be replaced by these 'science fiction suits'.

Cable-fed 'Aquacopter' Ready For Deepwater Trials

A cable-fed underwater vehicle dubbed an "aquacopter" has completed sea tests of Haugesund, Norway, and is due to undergo final deepwater tests in March.

Developed by A/S Møllerodden of Haugesund, the vessel, *CheckMATE*, is a 1.9-m, one-atmosphere clear acrylic plastic sphere designed to carry two people down to 300 m and give outstanding mobility within a radius of 100 m. It has an operation time of 5 hours and an emergency back-up time of 120 hours.

The unit has a displacement of 7,000 kg, a payload (with crew and manipulators) of up to 400 kg, an overall length (excluding manipulator) of 3.25 m, a total height of 3.2 m and a width over frame of 2.215 m. Horizontal speed is 3 knots; vertical speed, 2 knots.

A service section contains all other systems for vehicle operation and work (six thrusters, ballast system, multi-function manipulator operated by a master arm in the pilot's bubble, two gripping manipulators with suction or mechanical claws and an underwater television and eight lamps with total illumination of 4 kW).

Total length of the arm is 2.5 m, total weight is 250 kg, the "hand" gap is 150 mm with a 100-kp power, and the arm's lifting capacity is 80 kp.

Developers say the vehicle has good stability, visibility and maneuverability and should do well in such tasks as survey and inspection of platforms and underwater structures, pipelining and bottom sampling work. The vehicle is designed to permit installation of a high-pressure jet system for cleaning.

British Oceanics has monopoly of North Sea submersibles

The North Sea submersible industry turned into a one company operation this month. Intersub is to sell its submersible fleet, leaving British Oceanics as sole operator of North Sea submersibles. Low day rates paid by operators for diving work are blamed.

Parent company Northern Offshore could no longer guarantee loans to its submersible subsidiary and is to sell the fleet to pay off previous loans to Intersub. First Dallas, bank agents for a consortium of 14 others previously backing Intersub, has called time on the company, which has recently had difficulty in covering its operating costs.

Company overheads 'have risen very dramatically' while the market is either static or declining. One submersible, the *Intersub 4*, is still at work on the Transmediterranean gas lines; the remainder are laid up in Dundee being inspected by possible buyers. Intersub hopes to sell the fleet as a single unit.

Operators and owners have cut costs by using remote control vehicles (RCVs) for basic inspection, particularly the very small, very cheap 'eyeball' RCVs. Day rates for submersibles are claimed to have been held down to the point where both Intersub and British Oceanics have had to spend more on fulfilling certain contracts than they have received in payment.

An upturn in the submersible market is possible. Mounting concern about standards of offshore IMR may lead to more human intervention, complementary to RCVs. The increasing use of umbilical-fed bells may be limited by a UK Department of Energy crackdown on 'unsafe' dp diving vessels. Limitations on the length of umbilicals may further reduce the scope of bells.

Submersibles apart, the offshore inspection industry is booming because of an upsurge in structural inspection as a result of the *Alexander Keilland* incident. This follows a period of recession in 1978/79 which brought withdrawals, mergers and takeovers among some of the big contractors.

Taylor Diving and Salvage, part of the mighty Brown and Root empire, has withdrawn from B&R's Seamac barges and its divers have returned to America from their base in Rotterdam.

The Seamac diving spreads will now be used by a separate joint venture between Taylor and Wharton Williams.

Another partnership has been formalised with Houlder Offshore taking a 50% interest in Comex, Aberdeen, and increasing its stake in Comex, Marseilles from 2% to 16% at a cost of approximately £2.1 million.

An important part of the agreement between the two companies was a proposal for 'a substantial British centre of underwater technology associated with the existing Marseilles centre'.

No sooner was the partnership agreed, making Comex Houlder one of the largest diving companies in the world, than Houlder's parent company, Furness Withy, was taken over by Hong Kong shipping line CY Tung.

Tung's plans for Comex Houlder have not been revealed, but the new centre of underwater technology appears to have been quietly shelved.

Chinese Contract for COMEX

Comex Industries, France, has signed $9.9-million contract with the *People's Republic of China* for two diving units and two mini-submarines, and the training of Chinese divers and technicians for the units, in Marseilles, France.

A NEW submersible manufacturing company, Scandinavian Underwater Technology Corporation (SUTEC), is operating from Linkoping, Sweden, where the company has access to a variety of technical specialists at the Aerospace Division of Saab-Scania.

Personnel involved in the recently closed down Saab-Scania project, the development of the ROV Saab-Sub, have now taken over some parts of the Saab-Scania underwater technology programme.

SUTEC will manufacture a commercial version of the small observation vehicle, *Sea Owl*, which Saab-Scania originally developed for testing purposes only. The basic concept and the prototype has been extensively tested since 1975 and only two major changes will be introduced in the commercial product; increased thrust and micro-computer signal transmission. The most significant feature of this vehicle, it is claimed, is the extremely good controlability and manoeuvrability made possible by an advanced steering and control system.

The *Sea Owl* prototype is expected to be available for demonstrations and limited commercial operations at the end of June this year.

SUTEC will be a development and manufacturing company for the international underwater and offshore markets and act as both manufacturer and service company in Sweden.

NOW IN THE GULF OF MEXICO -
MERMAID II AND ALOHA

Need a three man submersible rated to a 1,000 foot diving capability with manipulator and CCTV? A Tethered (Remote) Underwater Survey System able to [illegible] 1,200 feet? Divers and support equipment for either [illegible] saturation diving [illegible] vessel [illegible] support any one or all of above? Then [illegible] IUC-Indeed. We [illegible] the equipment, methods and [illegible] water jobs done right.

IUC Gulf, Inc., Lafayette, LA (318) 232-9806
New York: 222 Fordham Street, City Island 10464
Tel: (212) 885-0600 — TWX: 147 242 IUC INC NYK
Texas — One Allen Center, Suite 1000, Houston 77002
Tel: (713) 759-9837 — TWX: 792 699 Geolog-Hou

IUC GULF

New Company Will Offer Underwater Vehicle Inspection Services

Jerry Jones has resigned as president of Ocean Systems to form a new, highly specialized underwater vehicle inspection services company, JERED. Co-owner in the new company is **Ed Trlica**, former vice president of Martech, and recently manager of Solus Ocean Systems' Gulf Coast Division.

The owners feel that a need exists in the offshore petroleum industry for a non-diving company to provide high-quality, unmanned vehicle inspection services. As new applications are required by the petroleum industry for unmanned, remotely controlled underwater devices, solutions to these applications can best be met by a high-technology, engineering-oriented company that provides a dedicated service, the JERED owners stated.

For the first year, operations will be restricted to the Gulf of Mexico, using specially prepared underwater vehicles manufactured by Perry Oceanographics. An initial order for four vehicles is part of a planned 14-unit package that will be delivered over a 48-month period. The initial four vehicles will be outfitted with color and black-and-white video systems, manipulator arms, and specialized electronic, non-destructive testing equipment. All vehicles will be capable of performing inspections inside platforms as well as on submarine pipelines.

A modern warehouse/office facility is being constructed in Houston for occupancy in October this year. The company's mailing address is: JERED, P.O. Box 218666, Houston, TX 77218.

THE FIRST Mermaid VI submersible to be completed by Brüker Meerestechnik has been delivered, and the second is now being built. This new design, based on three spherical pressure hulls, is certified for 600 m diving depth, to accommodate future exploitation of oil resources as well as rescue missions in deeper waters.

Mermaid VI's dry or wet transfer capability can be used for seabed techniques currently under development and it is suitable for offshore diver lockout inspection and maintenance tasks, as well as specialised dry-transfer rescue missions.

The minimum lockout time is six hours, with sufficient gas capacity and heating energy to compete with conventional surface-supported deep-diving systems.

A 1,100 mm diameter bow window provides good visibility and manoeuvrability has been improved for difficult jobs around offshore structures by the use of a steerable main thruster, a bow thruster and two vertical thrusters.

Friday, August 22, 1980

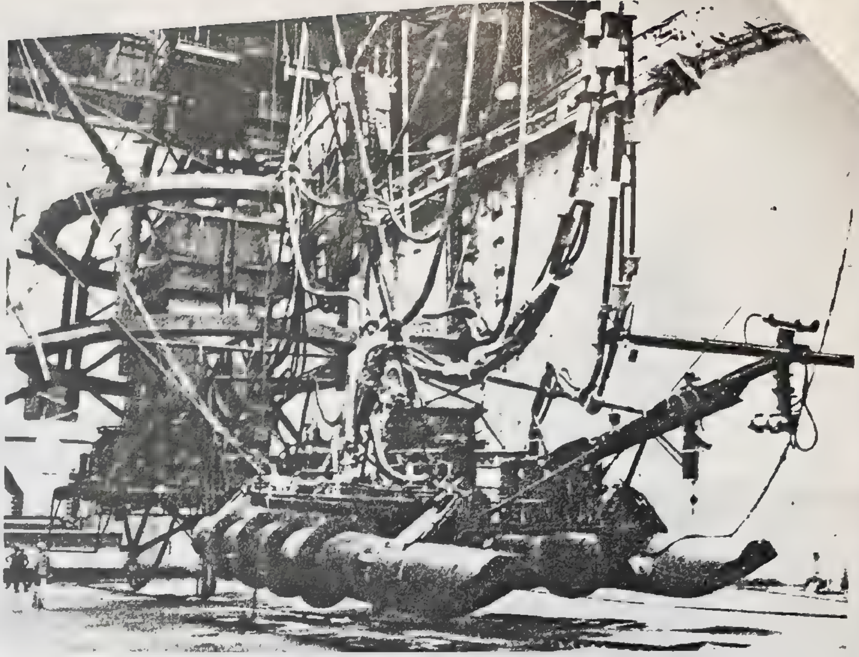
U.S. Envoy Says Sea Law Pact Is Near

GENEVA, Switzerland — U.S. Ambassador Elliot Richardson said yesterday a nearly complete draft treaty "on all aspects of the law of the sea" should be ready by the end of August.

Richardson is chief U.S. delegate to the U.N. Conference on the Law of the Sea, which has labored for seven years on a treaty governing the world's seas and their resources. He told reporters the conference "now stands an excellent chance of completing work on all outstanding issues" before its latest session adjourns next Friday.

"The substance of a new comprehensive treaty, in very close to its final form, on all aspects of the law of the sea, should be at hand for all to see" by that time, he said. He did not say whether a draft treaty would be made public.

The latest session of the conference opened here in July after years of haggling between industrialized and developing countries over world regulation and profit-sharing of deep-sea mining.



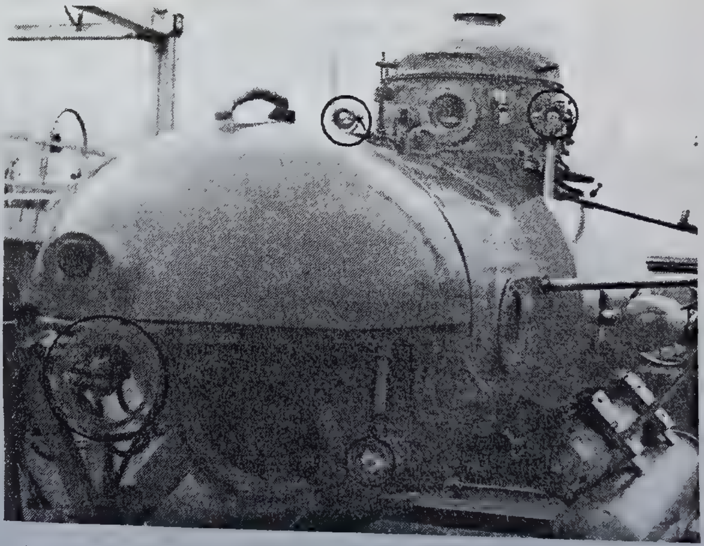
OCEAN MINER—Recently awarded patents have taken the wraps off the Ocean Minerals Company (OMCO) test miner, which was developed by LMSC's ocean systems organization to mine manganese, nickel, copper, and cobalt-bearing nodules from the deep ocean floor. The miner and other ocean floor equipment are shown here in the massive center well of the mining ship Glomar Explorer during tests of the equipment in the Pacific Ocean. The 100-ton miner is propelled by Archimedes screws on each of the pontoons, and is equipped with a crusher to break up the nodules before they are pumped to the surface. Two other pieces of equipment—a flotation device and a buffer—accompany the miner to the ocean bottom. The flotation device is positioned vertically between the miner and the buffer to keep the umbilical lines from fouling. The buffer holds a power transformer and stores crushed nodules to assure a steady stream to the surface.

Scorpio Monitors Trials Site

The British company Sub Sea Offshore's submersible vehicle *Scorpio*, under contract to Underwater Trials Limited, recently completed monitoring the preparation of a test site at Loch Linnhe, Scotland, for current U.K. Department of Energy underwater tethered submersible assessment trials.

The vehicle, positioned in 110 m of water, monitored the installation of a 4409-kg special purpose test rig incorporating various operational tasks for tethered vehicles, and the precision laying of a jackstay to the correct heading.

Sub Sea Offshore, with the associate company Sub Sea International which now incorporates the Sonarmarine unmanned vehicle division, also operates several inspection and manipulative submersibles including TROVs, TRECs and RCV 225s.



Jack Hope of Hope Industries in Willow Grove, Pa., has standardized on Snooperettes for his range of DEEP HOPE submersibles. Photo above shows the Deep Hope II with four of her six Snooperettes visible.

Deep-water Drilling

Diving to support exploration and drilling in water depths over 200 m (656 ft) is in its infancy, according to Odeco's Fred Roland, vice president of marketing. Examining the status of underwater intervention methods, Roland said, "Almost anything that must be done underwater in support of exploration and drilling can be done."

But he queried, "Will or can the operator pay the price?" As depths increased "the questions of practicability, likelihood of success, cost and safety will cause the operator to consider alternatives to intervention—particularly by manual methods."

After listing the main jobs to be done in depths greater than 200 m and the methods of intervention—wet, manual and unmanned—Roland said that in the interest of diver safety there appeared to be a swell of opinion developing against manual intervention. He concluded that there needed to be engineering improvement in several areas if deeper water was to be tackled. They included TV reliability, more definite sonars, riser buoyancy, loss of returns and well control (critical below 3,000 ft), subsea currents and waves, and location of enough able, qualified technicians.

In discussion, all methods of intervention had their supporters. Oceaneering International Services Ltd.'s vice president of special projects UK, Tom Earls, advocated the atmospheric diving suit (ADS) such as JIM and SAM. He said that operators must tell contractors what is needed. For an ADS he saw two priorities. First, tasks should be as repetitious as possible, because a job repeated could be done in a fraction of the time it took initially. Secondly, a subsea wellhead on which an ADS was to operate should be designed with ADS in mind. Equipment should ideally point in the same direction and should be within reach. One job deemed impossible with an ADS had, in the right conditions, eventually been tackled in only 30 sec.

Earls did not see ADSs working below 2,000 ft. There was a "terrific feeling of isolation" for the man dangling at that depth with a void below him. Earlier in the conference Dutchy Holland, corporate safety officer, worldwide, for Oceaneering, had pointed out that although an ADS might have life support for several days, for any period greater than 24 hr "it is not just a case of physiological support requirements but of psychological problems."

In cases where submarines had been trapped, generally more than one man was involved, but a man alone was different. If an ADS were trapped in deep water, a response must be made well within half its emergency life support. Even if a man were not dead after several days, he "might be a raving lunatic."

Ric Wharton, managing director of Wharton Williams Ltd., thought it unlikely that divers would practically be used in the wet below 1,500 ft, but he felt confident that oil found in ultra-deep water would be developed. The diver was unique in offering hand/eye coordination, tactile perception and an ability to react to forces—no machine could do that automatically. The use of manned and unmanned machines was "inevitable," but this meant that the concept of stacks had "to be totally changed, and it has to be changed so that it will accept a given tool."

Before money could be deployed for development, someone had to evaluate thoroughly what was needed. Present development of JIM, SAM, RCVs, etc., depended on random efforts by contractors "because they feel the need coming in the market." The oil industry had done "actually quite little towards designing systems." A stack designer faced the dilemma of not knowing which tool it might be operated by "because no proven standard workforce underwater tool exists."

Wharton said that identifying the most capable tool which might be produced was one task now being undertaken by a group of experts under the Department of Energy Chief Scientist Sir Hermann Bondi. Conference delegates saw a problem in the future funding of underwater technology development. A Spider flying atmospheric suit/submarine device which Wharton's firm was working on could cost $600,000 to $800,000 and development much more. Wharton asked, "How can any business that relies on the rental of divers and diving equipment with very tiny margins ever hope to finance that kind of development? It's impossible."

---

*The first underwater engineering symposium arranged by the Association of Offshore Diving Contractors (AODC) was held at Aberdeen University, Scotland, on April 5-6, 1979.

Solus Ocean Systems to Work for Chevron UK

Chevron Petroleum UK has retained *Solus Ocean Systems (SOS)* to provide a TREC unmanned tethered submersible for support of its drilling operations and the SOS saturation diving team installing a subsea completion unit in Ninian Field.

The market prospects: good worldwide, poor for the UK

Delegates to the two recent major underwater engineering conferences, in the USA and UK, have been learning the market prospects and forecasts for the industry. In worldwide terms they are still buoyant, reflected by the mood of the US conference. The troubled UK market, however, can expect only temporary relief according to oil company forecasts. Brian Cook reports

AN INDUSTRY beset by problems over safety and lack of contracts with little to look forward to in the immediate future — this sums up the North Sea diving sector. While the oil industry is keen to get the best out of the diving industry — even to the point of being slightly critical of efforts to improve diving systems and training — it has in many ways contributed to the collapse in confidence by its practice of buying diving services cheaply. Diving companies too often find that it is price advantage rather than expertise that wins contracts.

At two major conferences held this year some of these problems came under scrutiny with proposals for rationalisation of services being put forward by representatives of both the diving sector and the oil companies. But will the solutions work and if they do when will they be put into practice?

Delegates to the Association of Diving Contractors' international diving symposium in New Orleans earlier this year were told about a large number of new techniques and research programmes all designed to make diving a safer occupation and Cdr 'Jackie' Warner, head of the UK Diving Inspectorate, warned that much had to be done to improve safety for bell diving.

This same theme was evident at the Association of Offshore Diving Contractors' meeting held in Aberdeen several weeks later.

But the overall prognosis for companies operating in the North Sea was gloomy. Oil company predictions, articulated by Glen Young of Conoco, based on a survey of other oil companies, showed that demand for diving services, particularly vessel supported diving, was lower than capability. The number of dp-assisted vessels, for example, was higher by a factor of 1.5 than what was required between now and 1984.

Platform supported diving was on the increase, delegates were told, particularly in the helium range. Although this did not mean it would take over from diving vessel work, its percentage would certainly prevent any real expansion in the vessel supported diving industry.

If this is so, what can vessel owners do to get sufficient work to pay for their investment? Go overseas? Many of them are in spite of logistical problems such as setting up base facilities in countries which are increasingly insisting on a larger domestic element in their sectors.

Glen Young, however, began his address with a hint of optimism: 'Contrary to popular belief, the indicated short-term trend for underwater services is generally on the upswing. However, the bad news is that the overall requirement for diving and submersible services will level off and perhaps be on a downward trend by 1983. Worst of all, the demand for vessel-supported saturation diving is predicted to be well short of the available capacity for at least the next five years.

'Even though the installation/construction market will blossom with a few new structures in the next to three to four years, there is clear evidence of an ever-increasing downward trend in the relative amount of underwater services required for these new installations, some of which are equipped with onboard diving capabilities.

'There is no question that the oil companies have learned a great deal from their early experience in the mid/late-1970s and have evolved production system designs which they believe will require proportionately less underwater work.

'They have also indicated that there will be a trend to use more economical and efficient means of working underwater than from an adjacent saturation diving system equipped vessel.

'At the same time, it can be expected that most of the early installations in the North Sea will continue to require a considerable amount of maintenance in comparison with more recent installations.

'The indicated variation in underwater work requirements on a platform-per-year basis runs from a high of more than 26 diving vessel units per week (and associated offtake) per year to a low of four to six weeks per platform per year for a recently installed platform equipped for onboard diving.'

'Of particular interest to those following the one atmosphere diving unit and ROV side of the business is that our operators' poll indicates that the oil companies don't know what these systems can provide or they are just waiting for the right applications (for example, Conoco's new TLP on **Hutton**). There appears to be the need for more persistent salesmanship in this area!'

It must be said that the trend in the North Sea is not matched elsewhere in the world. Certainly the number of contracts being awarded worldwide would indicate that some members of the diving industry are managing to get by.

In the following pages, *Offshore Services and Technology* reports those aspects of working underwater which are of main concern to contractors.

Vehicle market share — North Sea

Submarines: The market for observation submersibles will increase from 75 unit weeks to 100 unit weeks by 1984. Lock-out demand will also increase but this is not seen as a major trend.

ROVs: Small units such as the RVC-125 and 225, Smartie and Fillipo will be finding greater use — from 100 unit weeks in 1980 to 125 unit weeks by 1984. Pipeline work is going to see some uptrend but is essentially flat. In the large special unit category, such as SAAB sub and tractor type units, there is a small market which will remain flat for the next five years. Over-capacity is less of a problem in the ROV market now.

ADS: This market forecast was based on one company's views and reflects an optimistic trend leading to a sharp upward movement from 50 unit weeks in 1979. Deep water work may see these systems replacing conventional sat systems.

Source: Glen Young, supervising engineer, Conoco, at AODC, Aberdeen, quoting oil company survey.

Soapbox

Congress Turns to the Oceans

After serving in the Army during World War II, Spark M. Matsunaga earned a J.D. from Harvard Law School and entered law practice. First elected to the U.S. House of Representatives in 1961 as a Democrat from Hawaii, he is now a U.S. Senator.

On the morning of July 24 while scanning the daily press before beginning work on this commentary, I noticed two provocative and timely news stories.

On page 1 of the *Washington Post*, under the headline "Cancer Outbreak Found at Two Texas Plants", there appeared an article reporting that federal officials had discovered a serious outbreak of cancer at two petrochemical plants and were concerned that "they may find a high incidence of brain cancer elsewhere in the huge industry that makes chemicals from oil."

The other article appeared on page 1 of the *Wall Street Journal*, under the headline: "All about Seaweed: Its Unhappy Fame, Its Unsung Virtues." Among those virtues, it appears, are a number of potential seaweed applications for products currently associated with the petrochemical industry — fibers, dyes, skin creams and others.

Those articles dramatize two trends in research that, in different but complementary ways, are promoting an increasingly widespread interest in the extraordinary range of potential offered by the oceans that cover three-fourths of the earth.

Without heightening public awareness of the limitations and risks of continued exploitation of many key land-oriented resources, such as petroleum, it is doubtful that the *Wall Street Journal* would feature articles extolling the economic potential of seaweed.

Or that, as occurred only a few weeks ago, the United States Congress would finally pass the Deep Seabed Hard Minerals Act, whose floor management I handled these past few years, taking up where the late Senator Lee Metcalf left off after introducing the bill nearly a decade ago. I wish Senator Metcalf could have been there to share in the deep sense of satisfaction that came with seeing this nation moving onto the threshold of a whole new world of economic development

Mining the sea is not a new idea, of course.

What is new, however, and extremely exciting for those of us in the Congress with an oceanic orientation, is the receptivity of policymakers and the voting public to the ideas we have been pushing so hard for so long.

For instance, whereas the seabed mining bill took nearly ten years to reach the President's desk, the Ocean Thermal Energy Conversion (OTEC) Research, Development and Demonstration Act that I introduced last year took less than ten months. The chronology of that Act offers convincing proof of the new mood.

Last August, Mini-OTEC, a joint venture of the State of Hawaii, Dillingham Corporation, Alfa-Laval Thermal, Inc., and Lockheed Missiles & Space Company, Inc., demonstrated the new power capacity of ocean thermal energy conversion for the first time.

In September I introduced the OTEC RD&D Act, the first OTEC bill ever, and a month later chaired initial hearings. I vividly recall a reception for the OTEC community at the time of the hearings. The reception was attended by 23 of my Senate colleagues who shared an atmosphere alive with excitement about OTEC's future. That turnout and that atmosphere would have been inconceivable on Capitol Hill a few years ago.

In November, Congressman Don Fuqua of Florida introduced the House counterpart of the OTEC RD&D bill. In December, Congressman Gerry Studds of Massachusetts introduced an OTEC financing and regulatory bill. I joined my colleague from Hawaii, Senator Daniel K. Inouye, in introducing a Senate equivalent of the Studds bill a few weeks later.

As the Senate and House versions of the two bills made their way through the relevant committees, the Office of Technology Assessment, a congressional research arm, held a well-attended OTEC workshop during which convincing evidence of the technology's potential was presented to a supportive audience of legislators and staffers.

In June, the OTEC RD&D Act, establishing a national goal of 10,000 megawatts of electricity capacity or energy product equivalent from OTEC systems by 1999, was approved by the Congress. The Act was forwarded to the White House where on July 18 it was signed into law by President Carter.

Only a few days before the OTEC RD&D Act was signed by the President, I had the pleasure of attending formal dedication ceremonies in Honolulu for the S.S. *Ocean Energy Converter* (also called OTEC-1) which will effectively launch the federal research effort aimed toward OTEC commercialization. OTEC-1 will be based at the OTEC Seacoast Test Facility site on the largest island in the Hawaiian chain.

Also in July, I chaired hearings in Honolulu on the energy crisis in the Pacific Territories brought on by almost total dependence on imported diesel fuel for energy needs. Due to rapidly escalating fuel costs, essential services have been cut back in every sector of the economy.

A major purpose of the hearings, conducted by the Senate Energy and Natural Resources Committee, was to examine the options for replacing oil dependence with indigenous renewable resources. And the resource most often mentioned by officials of the various territories, especially for baseload power, was OTEC. So the word is reaching all the way out to the furthest corners of the Pacific: OTEC is on the move.

I hope this rapid-fire 12-month chronology captures a sense of the new receptiveness for ocean technologies, not limited to OTEC by any means, that is taking root in Washington. Indeed, I expect strong support for a bill I have sponsored, an outgrowth of the Pacific energy hearings, mandating a study into the feasibility of employing sail-assisted technology to reduce fuel costs for inter-island surface transportation in the Trust Territory of the Pacific islands — more than 2,000 islands scattered over 3 million square miles, an area larger than the U.S. continental land mass.

As much as any other example, sail-assisted technology illustrates the extraordinarily exciting potential the oceans hold for inspiring a productive union of natural renewable resources, inherited human skills and the most sophisticated developments of modern technology.

The coming Decade of the Oceans promises to be a decade of excitement and discovery during which we finally begin to realize the vast possibilities offered by the water part of our world.□

Titanic's Mission Doubt Revealed

New York Times News Service

BOSTON — The expedition searching for the Titanic reached port here yesterday and although its organizers still believe they have located the wreck of the famed luxury liner scientists associated with the venture were less certain.

Scientists in the party said an analysis of the sonar images of the North Atlantic sea floor failed to reveal any conclusive evidence of the hulk. The 882-foot Titanic struck an iceberg and sank 380 miles southeast of Newfoundland 68 years ago.

"We did not find the Titanic," William B.F. Ryan, an expedition scientist, said in an interview soon after the expedition docked. Ryan is a geophysicist at Columbia University's Lamont-Doherty Geological Observatory.

"If we had had better weather and a little more time," Ryan continued, "we would have found it. Another week out there and we would have had it for sure. We were that close to discovery. I'm convinced that it will be found next year."

Mike Harris, the expedition leader, said he thought the group had in fact found the Titanic but agreed, "the only way we can prove it is to get down there with television cameras."

The research vessel, H.J.W. Fay, spent three weeks conducting a systematic sonar survey of the area where the Titanic went down. Jack Grimm, the Abilene, Texas, oilman who is financing the project, vowed to resume the search next year, probably returning for another sonar survey in the spring and then, if the hulk is located, going down in a manned submarine for a close photographic inspection. He has no plans to raise the ship, but he expects to recoup expenses through television, movie and book spinoffs.

One of the problems encountered in this summer's search was the complex and dynamic terrain of the sea floor in the wreck area. This confounded the searchers but fascinated the oceanographers, Ryan and Fred N. Spiess of the Scripps Institution of Oceanography.

The sonar soundings, Ryan said, produced some of the most detailed images ever made of the sea floor where continental geologic structures merge into deep-sea basins. The expedition scientists described the so-called continental margin area as a "scarred seascape of natural catastrophes that are apparently occurring at a pace more rapid than hitherto anticipated."

There, at depths of 12,000 to 13,000 feet, stretched a drainage basin carved by swift underwater currents to resemble river valleys and deltas on land. Sonar revealed deep gullies and canyons, ledges and cataracts, avalanche scars and scattered piles of debris.

In the reconnaissance survey, some of the ledges and debris piles were mistaken for possible shipwrecks. The particular sonar image that Harris, the expedition leader, said last Friday showed an object "the right length, right width and right height of the Titanic" turned out on closer inspection to be a ledge on the side of the large submarine canyon.

Given the area's dynamic geology, Ryan said, there is a "low probability that the Titanic lies in an unbroken piece in open terrain and a high probability that it is either buried in sediment or otherwise obscured by the geological features."

If this proves to be the case, project scientists said, it will probably take cameras and magnetometers to make a positive identification. The search was handicapped because the rough seas made it impossible in the last few days to lower cameras over the side of the ship and tore the magnetometer loose from the sonar sled, a device that is submerged and towed for the survey. The magnetometer would have been able to distinguish between a steel hull and most geologic features.

Natural Hydrocarbon Seepage Investigated at Texas A&M

Natural marine hydrocarbon seeps "occurring in small amounts locally can spread over wide areas of the Gulf and Caribbean. These comprise the predominant source of tar floating on the Gulf, on its beaches, and within and on the sediments of the bottom of the Gulf."

These are among the conclusions of a Texas A&M University program described in "Naturally Occurring Hydrocarbon Seeps in the Gulf of Mexico and the Caribbean Sea." The recently released report summarizes a wide variety of research related to natural marine seeps.

Mentioning historical documentation dating back to the 16th century, the report also notes the difficulty of tracing marine seeps and of identifying origin for specific oils.

As part of the research, funded by oil companies and Sea Grant, the submersible *Diaphus* videotaped fish swimming apparently obliviously through gas bubbles escaping from the seafloor. Researchers also collected seismic profiles clearly showing oil seepage.

Ship Found That Sank In 1853

New York Times News Service

WASHINGTON — Searchers in the Canadian Arctic have found the remains of the Breadalbane, a three-masted British square-rigger that sank 127 years ago, the National Geographic Society has announced.

The Breadalbane, its masts still upright, was detected late Wednesday with a sonar instrument towed by a Canadian Coast Guard icebreaker. It was found in about 300 feet of water, less than 90 miles from the magnetic North Pole.

The ship was crushed by shifting ice sheets early in the morning of Aug. 21, 1853. All 21 crewmen escaped to a nearby steamship. The National Geographic Society said that the sinking apparently is the northernmost shipwreck known.

The vessel's discovery came after a three-year search led by Dr. Joseph MacInnis, the head of a Canadian undersea exploration concern.

"It appears to be in one piece, and we suspect it is well preserved," said Robert C. Radcliffe, a spokesman for the National Geographic Society who talked with members of the expedition by radiotelephone Thursday. "Apparently the ship was sheared in the ice, and it sank straight down very quickly."

"On the television screen in the search ship," Radcliffe said, "it looked like a ghost ship floating across the sea."

The hunt for the 125-foot barque was conducted over three summers, but a National Geographic Society statement said that weather and sea conditions had permitted only six full days of active searching.

SUNKEN U-BOAT ARMED, UNSAFE

Raleigh, N.C. (AP) — The wreckage of a German submarine sunk off the North Carolina coast during WW II is "armed and dangerous," the Navy says.

PO first class Jerry Minser said Tuesday a fully armed torpedo protruding from a stern firing tube was found by divers during a five-week study of the wreckage.

"It is still armed and dangerous. That thing is sticking out and could explode if properly activated," Minser said.

The submarine, U-352, had 11 German sailors aboard when it was sunk by the Coast Guard during WW II. Its wreckage, discovered in 1975, has become a popular spot for sport divers.

Minser said Navy divers did not enter the rooms that crew members normally would have occupied and did not find any remains of the German sailors.

He said information gathered during the underwater study will be examined and a decision made on what to do with the wreckage, which is in the Atlantic Ocean about 26 miles southeast of Beaufort, N.C.

Minser said explosive specialists were unable to disarm the torpedo because they were not familiar with the detonating device.

Five artillery shells and nine other torpedoes — three of them armed — were found in the wreckage.

Navy Abandons Bid To Salvage Sunken Vehicle

The Navy said yesterday it is abandoning efforts to salvage a $750,000 unmanned vehicle that sank in 15,000 feet of water off Hawaii last January.

The vehicle, called a "remote underwater work system" (RUWS), was being tested off Hawaii when its tether to a control ship separated on Jan. 21. The depth to which the RUWS sank left only one possibility for salvage: the deep-diving rescue vehicle Trieste, based in San Diego.

Certified to dive over 16,000 feet, the Trieste worked July 21 to 27 trying to salvage the RUWS. The Navy said the terrain where the RUWS went down is too hilly and rocky for a successful rescue and no further attempt will be made to recover the vehicle.

Confederate Ironclad May Finally Go Off Duty

Preparations to raise a Civil War ironclad warship, which has harassed shipping in Savannah Harbor for 115 years and still carries dangerous unexploded ammunition, are being conducted by a team of scientists and students from Texas A&M University.

The project to salvage and partially restore the 200-ft Confederate warship *Georgia* could take five years and would be the first successful attempt in over a century to raise a sunken Civil War ironclad.

A&M research scientist Dr. Erv Garrison said detailed consulting work and operation of a magnetometer to detect metal in the muddy zero-visibility waters and shallow layers of silt have already begun.

Detailed examination of a section of the Union ironclad *USS Monitor*, sunk off Cape Hatteras, N.C., will also be used to determine the best way to raise the *Georgia*.

The U.S. Army Corps of Engineers wants to have the *Georgia* raised in the interests of future harbor development as well as historical preservation. The rebel vessel has been a boil on the backside of safe navigation in Savannah Harbor since its crew scuttled it in 1864. Wags say the ship is still on duty, protecting the South from all those Union ships and dredges, some of which have been seriously damaged after snagging the wreckage.

According to the Corps of Engineers, the *Georgia* may not leave her grave without a fight either: ammunition is still intact.

The ship went down with 500 tons of armor plates, at least four large guns and an entire stock of ammunition, which was located and analyzed late this summer.

Garrison, who believes the situation can be handled safely, said the investigating crew may use its two-man submarine *Diaphus* on the project if the Army Corps of Engineers gives the go-ahead.

NEW WORLD SIMULATED DEPTH RECORD SET
AT 2,132 FEET

The Summer 1980 Commercial Diving Journal reports that a new world record dive to a depth of 2132 feet (650 m) was successfully completed on April 2, 1980 at the Duke University Medical Center.

The (3) divers, Bud Shelton, a Duke Physician's Assistant, Billy Bell, a Medical student, and Steve Porter, an Oceaneering International diver, started the 28 day dive on March 6, 1980.

The (3) oceanauts arrive at the 1509 feet depth in the remarkable time of 12 hours and 20 minutes with no ill effects.

After 7 days they went down to 1640 feet (500 m), then on down to 1840 feet (560 m) the next day.

On Thursday, March 13, 1980, the divers were compressed down to 2000 feet (604 m), and on Friday, March 14, reached the new world record depth of 2132 feet (650 m) - with no serious ill effects and no perceptible weight loss.

One of the (3) divers did experience dysphea (shortness of breath), but they were able to work at relatively high levels without difficulty.

Decompression required 18 days, including treatment for knee bends at 147 feet.

NOAA Gives Universities Undersea Contracts Totalling $1.3 Million For Regional Activities

A total of $1.3 million in contracts has been awarded by the National Oceanic and Atmospheric Administration (NOAA) to three universities for undersea research projects. The recipients and the amounts are: University of Southern California, $150,000; University of Hawaii, $550,000; and University of North Carolina at Wilmington, $600,000.

NOAA says that these cooperative agreements mark the beginning of a regional underwater research program.

The University of Southern California will establish a Western Regional Undersea Laboratory to study Southern Pacific coast problems related to marine fisheries and the effects of pollution and other human activity on sea life. Studies also will be made of the kelp beds off the southern California coast. The system will include pressure chambers and support vessels of the university located on Catalina Island. Missions for diver-scientists will last as long as ten days.

The University of Hawaii will use submersibles (probably *Star II*) for studies aimed at evaluating natural resources, including sources of energy. Among the studies will be one investigating the effects of salvage dumping at four sites off Oahu and ocean dumping at 15 sites off other areas of the Hawaiian islands.

The University of North Carolina at Wilmington will coordinate the work of the Southeast Consortium for Research Efforts, which includes institutions from North Carolina, South Carolina, Georgia and Virginia. The consortium will establish a Southeastern Undersea Research Facility to study marine fisheries, seafloor processes, marine pollution, underwater archeology and diving physiology. Scientists will collect and analyze information on fish habitats, the effectiveness of commercial fishing gear, and seafloor obstructions. Data will be used to manage fish stocks and to determine the stresses of fishing and of pollution.

Principal members of the Southeast Consortium are the University of North Carolina, Duke University, Cape Fear Technical Institute, Virginia Institute of Marine Sciences, South Carolina Department of Wildlife and Marine Resources, Georgia Department of Natural Resources, North Carolina Office of Marine Affairs and the Division of Marine Fisheries, Research Triangle Institute and Ocean Agents, Inc.

CORRECTIONS TO DSPA ADDRESS LIST--OCTOBER, 1980

GAUDREAULT, Jacques A.
(ex-PISCES IV)
RES: 6 Woodlawn Rd.
Dartmouth, Nova Scotia, Canada
( ) 434-3583
BUS: CAN-DIVE Services, Ltd.

HALL, Richard W., Cdr., USN (Ret)
(ex-DSRV AVALON)
RES: 7312 Melotte St.
San Diego, CA 92119
(714) 698-0543
BUS: Lockheed Ocean Laboratory
3380 N. Harbor Drive
San Diego, CA 92101
(714) 569-3609

STAEHLE, Charles "Mike"
(ex-TRIESTE)
RES: 39 Sierra Lane
Arnold, MD 21012
(301) 757-3050
BUS: NOAA Office of Ocean Technology &Engineering Services (EDO)
6010 Executive Blvd
Rockville, MD 20852
(301) 436-6906

VETTER, Thomas G.
(ex-TRIESTE II)
RES: 11872-C Bernardo Drive
San Diego, CA 92128
(714) 485-5827
BUS: NEKTON, Inc.
11578 Sorrento Valley Rd., #25
San Diego, CA 92121
(714) 452-1792

ROSENCRANTZ, Don--correct business phone to (714) 225-2271.

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

JANUARY, 1981

Vol. XV, No. 1. Published by the Deep Submersible Pilots Ass'n

The Deep Submersible Pilots Association was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to:

Robert K. R. Worthington
Editor & Secretary, DSPA
3005 Curie St.
San Diego, CA 92122
(714) 453-1158

or

Donald E. Saner
President, DSPA
4707 Berwick Drive
San Diego, CA 92117
(714) 278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman & Vice-President, DSPA
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

1981 is underway. May the log show a steady course and smooth seas for all DSPA Members wherever they sail!

With the advent of the New Year, I relinquish command to our new DSPA President, Don Saner. Will Forman becomes Vice-President, and Ron Rau takes over as Treasurer. I will serve as Secretary in addition to putting out the NEWSLATTER, and Will Forman will continue as our perennial Membership Chairman.

Welcome on board to Al Smith-DEEP QUEST, Fred Haag-NEKTON, and Gerald Flaherty-International Underwater Contractors (IUC).

The DSPA T-shirts procured by Will Forman (Thanks, Will!) were much admired when displayed at the November luncheon, and Will found himself immediately swamped with sales out of his truck in Tarantino's parking lot--and Will without a vendor's license! (see Sec'y Notices) Members going overseas may want to take along extra shirts to pass along to Members encountered.

Our special thanks (and the very first DSPA T-shirt) went to Capt. C. McVean, USN, Commander Submarine Development Group One, for being our very informative guest speaker at the November San Diego lunch meeting. We had a record attendance, twelve Members and twelve non-members.

Will Forman also has under procurement embroideredDSPA emblems for wear on jackets,etc. Delivery in January is anticipated at a very nominal cost, probably $2.00 each. These, like our pins, are for Members only. It is expected that T-shirts, however, may be given to members of your families. They are not intended for the general public.

During my Christmas visit to Victoria,B.C., I paid a quick call on the PISCES IV group on board their nifty support barge PENDER at the Institute of Ocean Sciences at Sidney, B.C. Their support ship PANDORA II being on the East Coast on a geophysical research assignment does not leave them in irons. They can still utilize a tug to move PENDER to a mission site and thus operate very nicely with the comforts and conveniences of home. Frank Chambers extended a warm invitation to all DSPA Members to visit and to observe or participate in operations at any time. PISCES IV's busy diving schedule will continue unabated in 1981 with operations on both coasts. Frank described their intensive pilot qualification procedures, modeled after Navy "Qualification in Submarines" procedures, an outstanding system.

Glenn Minard, an early DEEP QUEST pilot and DSPA plankholder, reported in from Box 3627, Dubai, U.A.E. He has been engaged in underwater operations of one kind or another in the Mideast for ten years now. He and Ann have a 400-year old house in Falmouth, Cornwall, to which they retreat when the heat gets too much for them.

Irene Fager writes that the rising tide of prices and postage is submerging her beyond "One Half Fathom"and she's having difficulty keeping her head above water. What she needs is more paid memberships and fewer complimentaries, but she doesn't want to remove from her "comp" list people who cooperate by handling coversfor her group. Perhaps additional DSPA members would like to become paid subscribers or otherwise assist Irene in her problem. A subscription form is included in this NEWSLETTER.

The NEKTON vs. ABS merry-go-round appears more than ever to be a lost cause. There seems to be no way around John Reiter, and he refuses to enter a comprehensive discussion of the issues.

We lament the lapse of membership due to nonpayment of 1980 dues by the following:

Steve Boulton
Rick Olson
Ian Sanderson
Bob Starr

Don Keach
Jean-Marc Plancon
Larry Shumaker
Ray Toler

I feel sure that most of these pilots did not intend to resign, but we have received no response to repeated reminders.

SECRETARY'S REPORTS AND NOTICES

Dues for 1981 remain at $10.00 US for USA and Canada addresses, $5.00 for overseas, although postage rate increases may result in a net deficit. Unless your membership card says 80-81, you now owe dues for 1981. Any Member not paid up by 30 June will be suspended. If dues are not then paid by 1 September, he will be dropped from the membership rolls. Thereafter, until 31 December, he may apply for reinstatement by payment of dues plus a $10.00 penalty.

T-Shirts bearing the Dspa emblem (12" diam.) are now available. Price is $5.50 US in San Diego or $6.00 through the mail. Place orders with Will Forman and specify alternate choices due to stock limitations. Specifications include the following:

Color: white, yellow, light blue.
Size: small, medium, large, extra large.
Emblem: front, rear.

Decals and pins are still available at $1.00 and $2.00, respectively, from Forman or Worthington. Specify whether inside or outside decals are desired.

Embroidered DSPAbadges will be available shortly from Forman at an expected price of $2.00.

DSPA San Diego Luncheon Meetings

10/16/80

Members Present
Bob Worthington
Don Saner
Merle Wilson
Tom Vetter
Jack Bennett
Carroll Hoyt
Will Forman
Jerry Shiller
Doug Privitt
Ron Rau
John Schiltz

Non-Members Present
Tod Slaughter-AUGUSTE PICCARD
Capt. Enrique Dena-Gulf Maritime
Tim O'Brien-Lockheed Ocean Lab
Al Smith-DEEP QUEST
Dave McCafferty-Searle Consultants
Ken Privitt-MARFAB

Bob Worthington read a letter from Tim Askew, made announcements regarding scheduled symposia , and distributed the October NEWSLETTER and DSPA ballots.

Will Forman reported quoted costs for DSPA T-shirts and embroidered badges. Sizes, colors, quantities, and prices were discussed and decision was made to proceed with procurement. Will also reported that ABS has not replied to the DSPA ad hoc committee letter re NEKTON classing. Worthington will write to ABS, requesting a responce.

Doug Privitt generously came to the aid of Editor Worthington with a prepared list of address labels for DSPA Members. He reported that the Improved NEKTON is 90% complete despite dim hope of ABS classification.

Carrol Hoyt described NEKTON, Inc.'s legal action with the Dep't of Commerce regarding employee classification submersible pilots. Commerce contends they are shop technician-mechanics and should

be compensated as hourly employees; NEKTON considers them as seamen, Masters of submersibles, and treats them as salaried employees.
Don Saner reported that he just returned from MTS's "Marine Technology '80" and an interesting reunion of Presidential Yacht WILLIAMSBURG personnel. Don served on board during Truman's administration.--The Navy's fuel cell test program having been completed with record endurance dives, DEEP QUEST is being returned to her original storage battery configuration and the successful fuel cell shelved. There are no present intentions to proceed with installation in th DSRV's as originally intended or on the 20,000-foot SEACLIFF remodeling. The highly successful DEEP QUEST life-support system is also being ignored.
Jack Bennett reported that AUGUSTE PICCARD's overhaul is nearing completion, ready for trials when their support tug completes its repairs in Puget Sound and arrives at San Diego. PICCARD will have a DART installation capable of deployment while underway submerged, a new bow-mounted manipulator, and an improved on-board computer.
Jerry Shiller stated that the treasury contained sufficient funds for procurement of badges and T-shirts.

11/14/80

Members Present	Non-Members Present
Bob Worthington	Capt. C. McVean-ComSubDevGruOne
Jerry Shiller	Harry Cowles-AUGUSTE PICCARD
John Cameron	Tod Slaughter- "
Chris Landrum	Capt. Enrique Dena-Gulf Maritime
Jack Bennett	Tim O'Brien-Lockheed Ocean Lab
Don Rosencrantz	Al Smith- "
John Schiltz	D. P. Raetzman-Staff, CSDG-1
Ron Rau	John Dryfka-OIC DSRV AVALON
Dick Hall	Pat Baccei-AIOC "
Gary Rees	J. Dullea- "
Don Saner	D. Brown- "
Will Forman	Al May-Capt., USN (Ret)

Bob Worthington extended DSPA congratulations to Chris and Barbara Landrum on the arrival yesterday of their firstborn Ian Christopher; thanked Will Forman for procuring 120 DSPA T-shirts, available for sale today after this meeting; read a letter from Alan Whitfield; and introduced Captain McVean, the speaker of the day.
Capt. McVean gave a comprehensive description of the history and the current organization and operations of his extensive and varied San Diego-based command, Submarine Development Group One. Included in his command are the US Navy's deep-diving research submarine DOLPHIN, TRIESTE TWO, SEACLIFF, TURTLE, the two DSRV's MYSTIC and AVALON, two nuclear subs, and various surface vessels and saturation diving elements. In appreciation of his fascinating talk, Captain McVean was presented with a DSPA T-shirt.
Next meeting will be in January.

LETTERS FROM MEMBERS

Tim Askew-Harbor Branch Foundation (10/10/80)
"Just returned from MTS '80 where I had the pleasure of meeting Merle Wilson of NEKTON, Inc. One of these years I'll make it to a DSPA meeting.--Harbor Branch has had a very busy year thus far. We redeployed our one atmosphere submersible transfer chamber in May to a depth of 1980 fsw and successfully mated to it using JOHNSON-SEA-LINK II, which I believe is the record for a one atmosphere transfer. Also, both SEA-LINK's were recertified to a depth of 20000'(ABS).--This past summer, we accomplished two special missions. The first one was an operation on Georges Bank about 140 miles off Woods Hole, Massachusetts. This was performed in cooperation with NOAA's National Marine Fisheries Service. We conducted 31 dives ranging in depths of 200 to 10000 fsw.These dives were for baseline studies prior to drilling for oil which will commence in the next few hears. The other mission was conducted in the Gulf of Mexico at the East Flower Garden Reef, 110 miles SE of Galveston, Texas. This effort involved NOAA as well as Texas A&M University. This area has been nominated to become a marine sanctuary, and I hope it is selected,as it is teeming with marine life and corals, as well as a large brine seep which forms an underwater lake and river. We conducted 19 dives, 3 of which were lock-outs. Depths ranged frp, 60 to 350 fsw.--We will be working off West End, Grand Bahama Island on about two weeks, conducting pilot and diver training. This winter we plan to electrically refit SEA_LINK II, so we will be quite busy for the rest of the year."

Alan Whitfield-HMB SUBWORK (11/3/80)
"At present, I am running the diving from the deep drilling rig BORGNY DOLPHIN. We have MANTIS 003 and are working at 1108 feet in the Norwegian Trench.--I have spoken to Steve Boulton re the DSPA; he should be writing soon. --Enclosed is my OctoberNewsletter."

James Beachler-USS BONEFISH (11/16/80)
"This year has been one of constant underway on USS SEAWOLF. I have just transferred back to San Diego as COB on USS BONEFISH (SS 582). The boat is scheduled for WesPac in December. Obviously, I won't be able to attend monthly meetings until after the middle of next year."

Kevin Parker-Oceaneering International Services, Ltd. (11/17/80)
"Since my last communique with you I have been very busy. I no longer work with Thalassa. I am now back with Oceaneering International as their Submersible Special Projects Engineer. I spant the majority of September in Norway as Superintendent on the new Moellerodden tethered submersible CHECKMATE. For those with access to a Janes Ocean Technology, it is very much like a NEMO. She has plenty of power; and , due to a very ingenious system of hydraulic propulsion, enhanced by the position of the thrusters, she is ultimately maneuverable. Owing to the confidential nature of the tasks she was engaged in, I cannot go into more specific details, suffice to say that she is an excellent tool for the jobs she was designed around. As soon as 'reporting restrictions' are lifted, I will try to get more information to you. I have also been out to the ARMS III which is still working on the Smethwick Pentagone rig WEST VENTURE in block 31/2-f, also in the Norwegian sector.

Some of the Members may remember the LEO/HYCO Gulf of Mexico job in 1978. Steve Davies, who went over there as ny relief Superintendent, following his time at P.O. Subsea as Senior Lockout Pilot/Shift Sepervisor, has been made Crew Chief at O.I. on the ARMS III, about time, too. This bell is due for a refit soon, and so it may go to work elsewhere afterwards. I think I have mentioned Steve to you before; he tells me he has still not received the membership forms he requested two years ago. His present address is: Dykelands Farm, By Laurencekirk, Kinkardinshire, Scotland.--I am keen to purchase some of the badges and T-shirts when they come available. It may help people to become more aware of the DSPA. I feel sure the consultancy work carried out by Don Keach and Don Walsh will go a long way towards this anyway. I am experiencing a total consuming fit of jealousy just now. I just wish more people over here knew of the almost bottomledd wealth of information possessed by th DSPA in matters relating to subsea activities; then I might get some of the more glamorous jolliesinstead of beint sent to Norway to endure the dubious experience of having to pay £2.00 for a beer or £3.00 for a whiskey (they both taste the same, but they come on different glasses.--Best regards to everyone over there for Christmas and the New Year."

Richard Otter-Coleopter Ventures, Ltd. (11/23/80)
"Re October NEWSLETTER: A few chuckles might have been produced from seeing the lithium hydrocide at 465,00 per can.(Ed note: 4 and $ are on the same key!) Please note that these are for procurement at $65.00 per can, with a reduction to $55.00 per can if you don't mind a few dents. Al LiOH is sealed and serviceable. We still have approximately 700 cans.--An interesting note on communication grounds, via the NEWSLETTER. On SEA OTTER, communication grounds have been the least of our grounding problems. Still using a stainless whip, but double encased in shrink tubing. Nary a measurable electron.--Please disregard my last note. Storms not slowing us down. In the center of a 956 millibar (28.28 inches) low and we are still moving noving, but only because it's on our stern. Other 1000 and 1200-footers are hove to."

American Bureau of Shipping
Sixty-five Broadway
New York, N. Y. 10006

Refer to: JWR/fa
File Ref: T-16

15 July 1980

MARFAB Submersible Hull No. 1 ✓
Electrical System

MARFAB
1428 E. Borchard
Santa Ana, California 92705

Gentlemen:

Attention: Mr. Douglas N. Privitt

We have your letter of 20 June 1980 on the above subject and with regard to the items contained therein we advise as follows.

We have reviewed your report "Grounded vs. Ungrounded Electrical Systems for Use in Manned Submersibles." We note that you consider the probability of a shock in a grounded system to be twice the probability for an ungrounded system and we also note the result your calculation indicating that approximately 500 VDC would be necessary to freeze a persons motor system. We would point out, however, that the International Electrotechnical Commission has established that the smallest perceptible shock, defined as the upper limit of "usually no reaction," is 2 ma. Using this value in place of the 60 ma freeze value in your calculation would result in a threshold voltage of 17 VDC, with no safety factor. At this level a person may instinctively react to the shock. This instinctive reaction could cause the person to injure himself or the vehicle by sudden uncontrolled movements. Given the facts that the shock probability is twice as large for a[redacted]grounded system, the perceptible shock level is so low, and the information discussed in our previous correspondence on this subject, we believe the Committee acted prudently in maintaining the requirement for ungrounded systems.

With regard to your statement that surface radio installations are in violation of 7.13 of the Rules, it was intended to exclude communications systems from 7.13 by utilizing the wording "power, heating, or lighting." We will evaluate the need for making this more explicit in the next edition of the Rules.

With regard to the classification of the subject vessel, we must advise that we would not be able to class the vessel with a grounded electrical system.

Floor File

TELEPHONE: 212-440-0300 CABLE ADDRESS "RECORD" TWX: 710-581-3089 TELEX: ITT 421966 RCA 232099 WUI 620353

DEEP SUBMERSIBLE PILOTS ASSOCIATION

July 23, 1980

Mr. W. M. Hannan, Vice President
AMERCIAN BUREAU OF SHIPPING
65 Broadway
New York, NY 10006

SUBJECT: A.B.S. Classification of "NEKTON" Submersibles

Dear Sir:

At a recent meeting of the Deep Submersible Pilots Association, I was appointed chairman of an ad hoc committee to study problems related to obtaining an A.B.S. classification on the new "Improved Nekton" submersible. Our committee has reviewed items of correspondence and notes on phone calls between Marfab and A.B.S. from 1978 to the present. It is obvious from the materials reviewed that MARFAB's "Improved Nekton" submersible, as designed, will not comply with Section 7.13 (Ungrounded electrical systems) of the A.B.S. publication "Underwater Systems and Vehicles 1979", and that this discrepancy is preventing a beginning of its review by A.B.S. for classification. We suggest that A.B.S. may wish to consider this submersible for classification under Section 1.5, titled "Alternatives". In part, this section states: "The Committee is at all times ready to consider alternative arrangements, materials and equipment which can be shown either through satisfactory service experience, or a systematic analysis based on sound engineering principles, to meet the overall safety and strength standards of these rules". Based on the facts cited below, we believe that the Nekton design complies fully with reasonable criteria for safety under the stated guideline for "alternative arrangements".

1) Three previously fabricated Nektons using identical electrical systems, have operated successfully and safely for approximately 2700 dives and 5400 hours of dive time during the period they were owned and operated by the Nekton Corp. of San Diego. Two of the boats are classified by A.B.S. under certifications #0021 and #0022.

2) Hazard to crew and passengers from electrical shock are shown by the enclosure hereto, to be minimal. Even under the most adverse circumstances of operation at sea, less than 6 Ma D.C. current shock is apt to occur. This is far below the 80 Ma dangerous level or the 15 Ma hazardous level.

3) The only other potential problem posed by the system is induced galvanic action which could result in damage to the hull. Controversial theory aside, the fact is, that after a period of more than a decade, under occasionally abusive conditions, no induced corrosion is detectible on the three Nektons which have been in service. Probably the fact that the bare electrical wires corrode and self-insulate in extremely brief periods, as well as the fact that negative ground systems are basically cathodically protected, would best support the actual evidence.

In a letter to Mr. Worthington of D.S.P.A., dated 8 March 1978, (file T-16), Mr. Russen indicated that the "Bureau remains prepared to consider alternative arrangements which can be shown to meet the overall safety standards of the rules".

We sincerely hope that the information transmitted in this letter will provide you with adequate reasons to consider MARFAB's application for classification fully and favorably. The D.S.P.A. will be happy to provide further comment or discussion on any of the matters discussed.

Best regards,

Will

W. R. Forman
Chairman D.S.P.A. Ad Hoc Committee
on "Improved Nekton" Classification

WF/vb

REQUIREMENT 1

SAFETY (PERSONNEL HAZARD)

1. Purpose. This requirement establishes criteria for the design and development of military electronic equipment to promote maximum safety for personnel and equipment.

*2. Documents applicable to Requirement 1:

MIL-B-5087	Bonding, Electrical, and Lightning Protection, For Aerospace Systems
MIL-STD-1458	Radioactive Materials: Marking and Labeling of Items, Packages and Shipping Containers for Identification, In Use, Storage and Transportation
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
ANSI C1-1975	National Electric Code
ANSI C95.2-1966	Radio Frequency Radiation Hazard Warning Symbol
ANSI N2.1-1969	Radiation Symbol
ANSI Z35.1-1972	Accident Prevention Signs, Specification for
ANSI Z35.2-1968	Accident Prevention Tags, Specification for
ANSI Z53.1-1971	Marking Physical Hazards, Safety Color Code for

Code of Federal Regulations, Title 10, Chapter I, Part 20
Code of Federal Regulations, Title 21, Chapter I, Subchapter J
Code of Federal Regulations, Title 29, Chapter XVII, Part 1910

3. Definitions. The following definitions apply to Requirement 1.

3.1 Chassis, electrical equipment. The chassis is a structural item fabricated in such manner as to facilitate assemblage and interconnection of electrical or electronic items for the specific purpose of providing a basis for electrical or electronic circuits. It normally has drilled or stamped holes to accommodate the items but may include only the items necessary for its own mounting and support.

3.2 Frame. The frame is any construction system fitted and united together, designed for mounting or supporting electrical or electronic parts or units.

3.3 Fail-safe. The design feature of a part, unit or equipment which causes the item to fail only into a non-hazardous mode.

4. General consideration. The design and development of all military electronic equipment shall provide fail-safe features for safety of personnel during the installation, operation, maintenance, and repair or interchanging of a complete equipment assembly or component parts thereof.

4.1 Additional considerations. Proper instructions in accident prevention and first-aid procedures should be given all persons engaged in electrical work to fully inform them of the hazards involved.

a. Current rather than voltage is the most important variable in establishing the criterion for shock intensity. Three factors that determine the severity of electrical shock are: (1) quantity of current flowing through the body; (2) path of current through the body; and (3) duration of time that the current flows through the body. The voltage necessary to produce the fatal current is dependent upon the resistance of the body, contact conditions, and the path through the body. See table 1-I.

Table 1-I. Probable Effects of Shock

Current values (milliamperes)		Effects
AC 60 Hz	DC	
0-1	0-4	Perception
1-4	4-15	Surprise
4-21	15-80	Reflex action
21-40	80-160	Muscular inhibition
40-100	160-300	Respiratory block
Over 100	Over 300	Usually fatal

b. Sufficient current passing through any part of the body will cause severe burns and hemorrhages. However, relatively small currents can be lethal if the path includes a vital part of the body, such as the heart or lungs. Electrical burns are usually of two types, those produced by heat of the arc which occurs when the body touches a high-voltage circuit, and those caused by passage of electrical current through the skin and tissue. There are various methods of incorporating adequate safeguards for personnel, many of these methods being implicit in routine design procedures. However, additional design requirements and relative information pertaining to safety of personnel are outlined and detailed in this military standard. While current is the primary factor which determines shock severity, protection requirements of this standard are based upon the voltage involved to simplify their application. All voltages expressed in this standard apply to the dc value or the rms value for ac. In cases where the maximum current which can flow from a point is less than the values shown above for reflex action protection, requirements may be relaxed with the approval of the procuring activity.

c. Human engineering factors affecting safety should also be considered when establishing general or detailed design criteria. Rigorous detailed operational or maintenance procedures are not acceptable substitutes for an inherently safe design. Hazard and safety requirements of MIL-STD-1472 should be used as a guide.

5. Electrical. The design shall incorporate methods to protect personnel from accidental contact with voltages in excess of 30 volts rms or dc during normal operation of a complete equipment. Means shall be provided so that power may be cut off while installing, replacing, or interchanging a complete equipment, assembly, or part thereof. Personnel shall be protected from capacitor discharges and when changing fuses or tubes. The main power ON-OFF switch located on the equipment (clearly labeled as such) shall cut off all power to the complete equipment. The power input side of the switch and the incoming power line connections shall be given physical protection against accidental contact. Suitable internal protective measures are defined in table 1-II.

5.1 Electrical power. Interface with electrical power sources shall be in accordance with the applicable regulations or requirements. (For example, commercial power input shall be in accordance with ANSI C1-1975.)

Table 1-II. Suitable Internal Protective Measures 1/

Type of protection	None 2/	Guards and barriers	Enclosures	Marking		Interlocks		Discharge devices	
				Voltage	Warning	With bypass	No 3/ bypass	Auto-matic	Ground rods
See paragraph / Voltage range		5.7	5.8	9.1	9.2	5.8b	5.8c	5.13	5.9
0 - 30 Volts	X								
30+ - 70 Volts	X							X	
70+ - 500 Volts		X		X		X		X	X
500+ - 1000 Volts			X		X		X	X	X
1000 Volts up			X		X		X	X	X

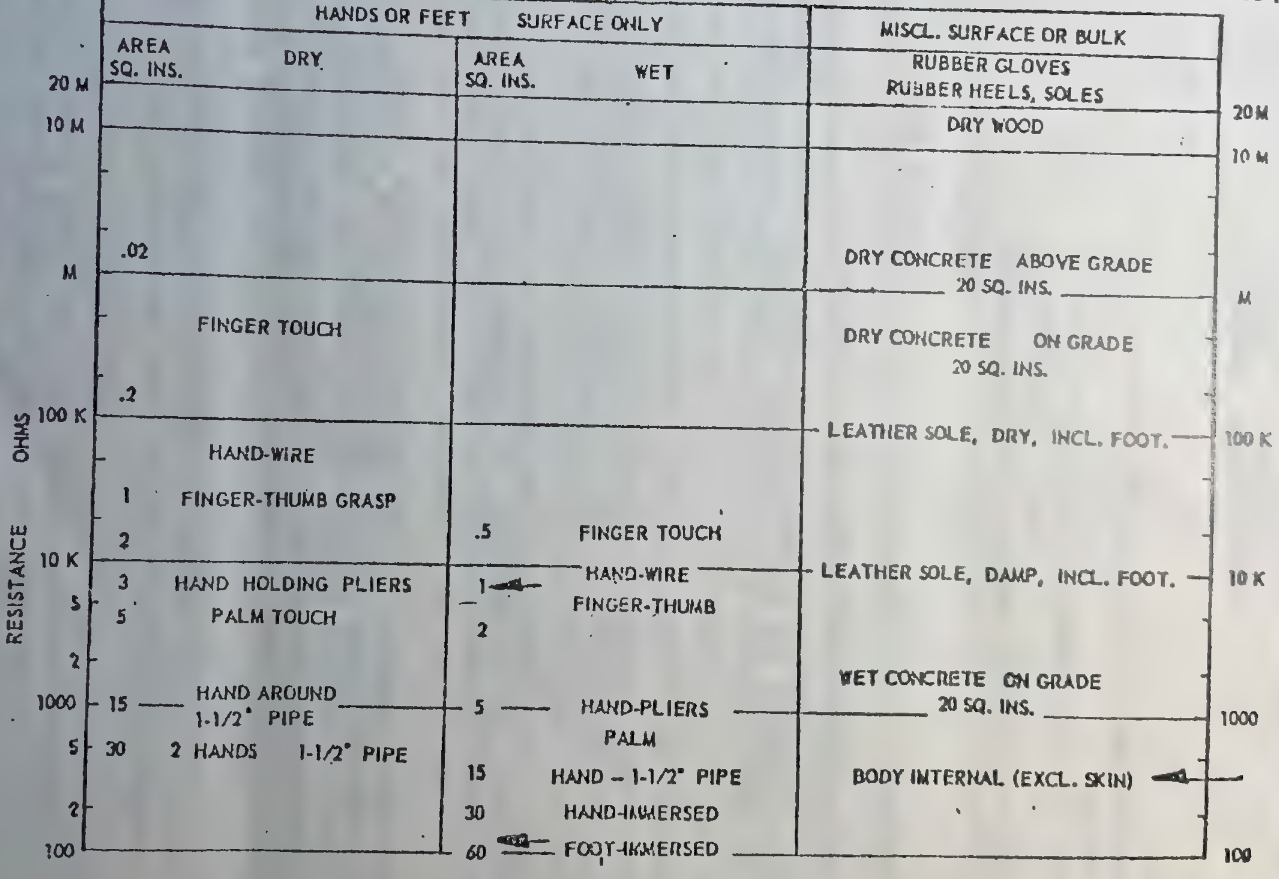
1/ Confine the application of headings to voltage ranges checked. However, more than one option may be available on design requirements.

2/ Although no specific requirements exist for servicing 0 - 70 volts, designs should be reviewed for possible hazards in accordance with table 1-I.

3/ Designs may use "No bypass" interlock applications below 500 volts; but the intent here is to imply complete enclosure.

FROM:
ELECTRICAL SAFETY PRACTIC
ISA MONOGRAPH #110
(INSTRUMENTS SOCIETY OF AME
BY RALPH H LEE (1965)
SENIOR ELEC. ENGR
DU PONT

FIGURE 1
TYPICAL LOWEST RESISTANCES
OF INDIVIDUAL ELEMENTS
OF HUMAN CIRCUITS



ENCL (7)

DEEP SUBMERSIBLE PILOTS ASSOCIATION
3005 Curie Street
San Diego, CA 92122

30 November, 1980

American Bureau of Shipping
65 Broadway
New York, N. Y. 10006

Attention Mr. W. M. Hannan, Vice President

Dear Sir:

SUBJECT: ABS CERTIFICATION OF IMPROVED NEKTON SUBMERSIBLE

The Deep Submersible Pilots Association has investigated and discussed the arguments for and against the low-voltage, grounded electrical system of the "Improved NEKTON" submersible (reference letter W.R. Forman to W.M. Hannan, dtd 23 July, 1980) and believes the system to be compatible with the safety requirements for manned submersibles.

In view of the proven safety and reliability of the practically identical electrical systems in existing classed NEKTON's and the evidence that such a low-voltage, grounded DC sustem is probably safer than the higher voltage ungrounded systems used in other submersibles, there appears to be ample grounds for consideration of the NEKTON system as an "Alternative" under paragraph 1.5 of "Rules for Building and Classing Underwater Systems and Vehicles".

The DSPA is concerned at the continuing lack of a positive response on the part of ABS to our requests for such consideration.

We remain available at any opportunity to discuss the matter technically with you or your representatives if you so desire.

A reply at your earliest convenience will be greatly appreciated.

Cordially yours,

Robert K. R. Worthington
Captain, U. S. Navy (Ret.)
President, DSPA

cc John Pritzlaff
Westinghouse Oceanics
MARFAB
Frank Busby

American Bureau of Shipping
Sixty-five Broadway
New York, N. Y. 10006

Refer to: JWR/fa
File Ref. T-16

5 December 1980

MARFAB Submersible Hull No. 1
Electrical System

MARFAB
1428 E. Borchard
Santa Ana, California 92705

Gentlemen:

Attention: Mr. Douglas N. Privitt

We have your letter of 7 October 1980 in response to our letter of 15 July 1980 on the above subject and with regard to the items contained therein we advise as follows.

With regard to the last sentence of the second paragraph of our letter we advise that it contains a typographical error and should read "Given the facts that the shock probability is twice as large for a grounded system..." which is indicated on page 6 of the study forwarded with your letter of 20 June 1980.

The 2 mA upper limit of "usually no reaction" established by the International Electrotechnical Commission is a DC current value; for AC the value is 0.5 mA (50 - 60 Hz).

With regard to a safety factor and our acceptance of a vessel with a grounded system having such a safety factor we advise that we are not prepared at the present time to recommend that the Committee consider adoption of such a safety factor. This is due to the fact that ongoing studies are investigating such safety factors and we would consider it premature to specify such safety factors before these studies have been completed.

We have not chosen to use any particular shock current levels. Rather, we were providing you with a technical basis for the Committee's actions.

With regard to a list of all submersibles classed by the Bureau we would be pleased to provide such a list. Our cost for this service would be $435.00 and we will provide the list upon receipt of your remittance.

Yours very truly,

AMERICAN BUREAU OF SHIPPING

W. M. HANNAN
Vice President

Floor File

by

John W. Reiter
Principal Surveyor-Machinery

cc: ABS Los Angeles
cc: ABS San Francisco

TELEPHONE 212-440-0300 CABLE ADDRESS "RECORD" TWX: 710-581-3089 TELEX: ITT 421966 RCA 232099 WUI 620353

U.K., France Now Lead In Submersible Building

Staff Report

Offshore oil and gas exploration, drilling and production continued to dominate the market for submersible services in 1980. The most dramatic change was the upsurge in the use of unmanned submersibles, called Remotely Operated Vehicles (ROVs).

Diving companies are buying ROVs to make their suite of equipment more appealing to customers and complement their stables of divers. Carl Helwig of Subsea International, New Orleans, told *ST* that of his company's total increase in personnel in the last year over one-half was due to hiring technicians to run the ROVs.

This update of the manned submersible field is based on two previous articles in *Sea Technology*. One was the exhaustive "An Overview of Submersible Activities Worldwide in 1977" by R. Frank Busby on page 15 of the January, 1978 issue. Busby has become the leading world authority on submersibles. His exclusive review of Russian submersibles appeared in *ST* for July, 1980, page 18.

The other background article was "Manned Submersibles Still Hold the Upper Hand" in *ST* for December, 1979, page 10. Much of the updating material appearing here is taken from a private report prepared by Busby.

Four Classes of Submersibles

In this review there are four classes of vehicles noted:

- One-Atmosphere (Free-Swimming) Vehicles. In these the occupants are at one atmosphere. They are self powered and untethered. They include the well-known *Alvin*, *Pisces* series and the Perry-built PC series. An exception is the OSEL Group's *Mantis*, a one-man vehicle powered by a surface tethered cable.
- Observation/Work Bells. Occupants are at one atmosphere pressure. They are either self-powered or supplied through the tether.
- Atmospheric Diving Suits. Occupants are at one atmosphere pressure, powered either by humans or external power. They are anthropomorphically configured and offer manipulative dexterity. JIM, *Wasp* and *Spider* are in this category.
- Lockout Vehicles. In these one section is always at one atmosphere pressure. A second section can be brought to ambient pressure to lock-out and lock-in support divers. They are either self-powered or receive power from a surface supplied umbilical. Typical of these are the two *Johnson-Sea-Link* vehicles, a Perry PC series and *Shelf Diver*. Included in this category is the *Mobile Diving Unit*, a hybrid vehicle and an observation/work bell.

Two-Year Numbers Growth

In all categories of vehicles the number has risen from 103 worldwide in 1978 to 133 in mid-1980. One-atmosphere vehicles rose from 62 to 69, observation and work bells from 7 to 13, one-atmosphere diving suits from 12 to 23 and lock-out vehicles from 21 to 28.

The greatest increases are in the observation/work bells and the atmospheric diving suits. This is attributed to their greater manipulative dexterity and maneuverability over vehicles that can range over wider areas.

More countries are operating manned vehicles. In 1978 there were 11 countries. Now it has increased to 15. The new countries are Yugoslavia, Norway, the People's Republic of China and Rumania.

Since the 1978 report 11 vehicles have been taken off the list because they are no longer in service or have not dived in the last two years or were never funded for construction. They are the *Asherah, Sea Ranger, Sea Explorer, Neree, Tetis, Skadoc-1000, Moana I, OSA-3, Opsub, Johnson-Sea-Link III* and *MOB 1003/1004.*

Dominant Constructors Change

In 1978 the dominant nations in construction of manned submersibles were the United States and Canada. But in the two years since then France and the United Kingdom have come to the fore.

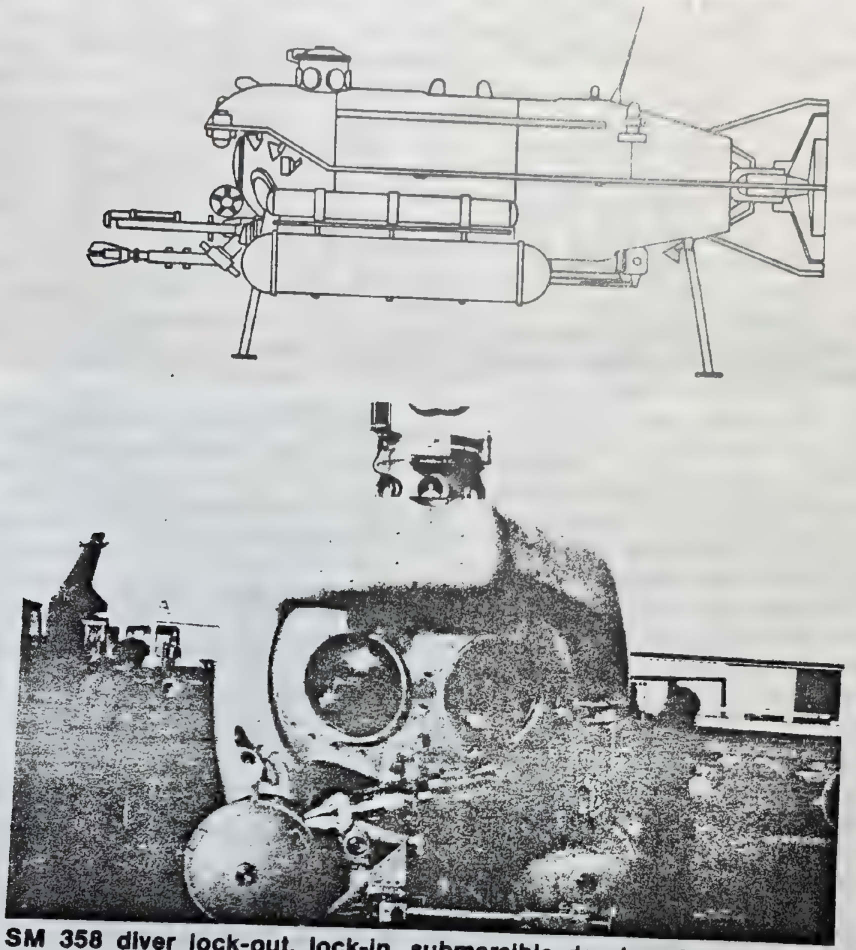
Canada

In Canada the observation and work vehicle *Arm IV* has been constructed, completed in July 1980. The builder is Can-dive Services Ltd., North Vancouver, B.C. Canada's biggest producer, Hyco Ltd., was placed in receivership in 1979 and manufacturing halted. Hyco's facilities were taken over by Canadian Underwater Vehicles Ltd.(CUV).

CUV has been selected by the Soviet Union to build the 6,000 m depth capability *Akademik* by the Institute of Oceanology of that country. *Akademik* will feature a titanium hull furnished by the Soviets and hydrazine gas system for forcing out liquid ballast, for the variable buoyancy control, driving turbines for power and furnishing heat for the vehicle. CUV will also construct three 6,000 m depth capability ROVs for the Russians.

France

In France Comex Industries Marseille, has built three diver lock-out submersibles. They are the SM-351(2) and the SM-360. SM-351(1) has been delivered to a Rumanian institute devoted to underwater research. SM-351(2) is being delivered to the People's Republic of China(PRC). PRC will take delivery of the SM-360 by the end of the year. They are reportedly to be used in support of offshore oil and gas activities.



SM 358 diver lock-out, lock-in, submersible developed by Comex Industries, Marseille, France, front view and side schematic view. It can perform observation missions to 300 m with a pilot and observer; conduct atmospheric transfer operations on sea bed production facilities down to 300 m using a special skirt; and with one pilot, one observer, one bellman and two divers can operate for four hours bounce diving down to 100 m with pressurization of diving compartment, or two man-hours saturation diving to 200 m with pressurization on board the ship.

Another Marseille firm, Services et Activites Sous-Marine(SAS), completed the vehicle *Sea Cat* in 1979. It is being employed in undersea survey work.

The government Centre National Pour l'Exploitation des Oceans (CNEXO) has completed design for the 6,000 m depth submersible SM-97. It will have a titanium hull. Its mission will be in support of scientific research by CNEXO. Testing of a titanium hull prototype hemisphere was due to be completed by the end of this year.

Also due to be completed by this fall was the lock-out submersible *Licorne*. The 300 m vehicle was built by Centre d'Etudes et de Recherches Techniques Sous-Marine—(CERTSM).

Italy

In Italy two observation/work vehicles have been produced by Drass of Zingonia for Sub Sea Oil Services, Milan. The first, the AWOC 650, is operational. The second, the AWOC 300, was due to be completed this year. The Italian Navy is sponsoring construction of a submarine rescue vehicle designated the SM-1. It is to be built by Cantiere Navel Vrede, Venice.

Sub Sea Oil Services is pressing a development program it calls PH-Phoenix. The main feature will be a closed cycle diesel engine to furnish power. The PH-1 would be a short range diver lock-out submersible, the PH-2 medium range submersible and the PH-3 a long range submarine. A submarine is defined as capable of independent operation.

The PH-1 will operate in conjunction with a saturation diving system installed on a tender vessel which would also support the sub during operations. It would have a maximum lock-out depth of 500 m. Its capabilities would be complete diver support such as helium-oxygen breathing gas, heat, water, food and waste bags. It would have four pilot-operators in the one-atmosphere compartment and four divers in the lock-out compartment. In emergency rescue conditions it could accommodate ten divers.

Japan

In Japan the Japan Marine Science and Technology Center (JAMSTEC) has commissioned Mitsubishi Heavy Industries to build the 2,000 m depth, one-atmosphere submersible *Sinkai 2000*. Launching is expected to take place next month. It will work with the support ship *Natsushima*. It will be used for scientific research support by JAMSTEC.

In 1978 the observation/work bell *Tankai* was put into service by Fukada Salvage and Marine Works Co., Tokyo. It was built by Nippon Kokan Kaisha. It is unique in that the upper pressure hull hemisphere is composed of steel and the lower hemisphere of acrylic plastic, thus providing a panoramic view downward. A viewport in the hatch provides vertical upward viewing. Also unique is the use of water jets for propulsion.

Norway

An observation/work bell *Checkmate* was built by and is operated by A/S Mollerodden based at Haugesund. It is powered through an umbilical and can operate down to 300 m. The spherical pressure hull is composed entirely of acrylic plastic with aluminum inserts at top and bottom for attachment to the exostructure and for through-hull penetrations. Its mission is to inspect and maintain structures and pipelines.

Switzerland

In 1979 a one-atmosphere submersible the *F.A. Forel*, originally designated the PX-28, was delivered to the Foundation Pour l'Etude at la Protection de la Mer et des Lacs which is located at Cully. Its depth capability is 500 m and carries a crew of three. It was designed by Jacques Piccard and built by Giovanola Freres of Monthey. Operated by the Foundation, it will be used for research.

WASP one-atmosphere diving suit built by OSEL of Great Yarmouth, United Kingdom.

United Kingdom

In the last two years four firms have produced manned vehicles in the United Kingdom. They are: the OSEL Group in Great Yarmouth, Norfolk; Slingsby Engineering, Kirbymoorside, Yorkshire; DHB Construction Ltd., Alton; and Oceaneering International, Aberdeen.

OSEL has constructed four 600 m depth capability *MANTIS* one-man vehicles and is building two more. Unlike other one-man vehicles the *MANTIS* can operate as an unmanned ROV. OSEL also builds the *WASP* a one-atmosphere diving suit. Out of four produced, two have been built in the past two years and two more are under construction. All have been built for Oceaneering International.

Slingsby has produced two one-atmosphere diving suits called *Spider*. They were designed in conjunction with the vehicle operator, Wharton Williams Ltd., Aberdeen. *Spider* is similar to *WASP*. It is powered by a surface connected umbilical and maneuvers by six infinitely varible thrusters. Two extendable suction pads, called "sticky feet," permit it to attach itself to a structure to carry out a job. *Spider* is designed as a system which includes a control van, winch, lift system, cable and the vehicle itself. Thus it can operate from a vessel of opportunity, requiring no dedicated ship.

The best known modern one-atmosphere diving suit, *JIM*, has been built by DHB Construction. Oceaneering International operates those produced so far, with the first one having been deployed in 1974. Today there are 15 operational, with one built in the past two years and another under construction.

The 15 *JIM*s are grouped into four types. Those now operating are the II,III,and IV series whose respective depth capabilities are 457 m, 305 m and 605 m. Like *WASP* and *Spider, JIM* is powered by the human operator and lowered on a stage to the working depth by a cable.

In 1979, Oceaneering International and OSEL collaborated to produce the observation/work bell *Arms III*. The earlier I and II versions were constructed by Perry Oceanographics. They operate to 914 m. *Arms III,* unlike the earlier versions, obtains its power from an umbilical cable rather than onboard batteries. *Arms III* has two Perry manufactured manipulators and a General Electric force feedback manipulator.

United States

In the past two years Perry Oceanographics has been the only U.S. constructor of submersibles. Three vehicles were completed: the PC-1602; Mobile Diving Unit (MDU); and Observation Manipulation Bell-1(OMB—1). A second bell, OMB-2 is under construction.

PC-1602 and OMB I were both constructed for Saipem of Italy. That company operates the huge pipelay barge *Castoro Sei* that is laying gas pipelines from Sicily to Algeria, using the services of the two submersibles. For a story on the *Castoro Sei*'s work see *ST* for October, page 14, and an earlier one July, 1979, page 10.

MDU is located in Aberdeen, Scotland, where it is assigned to Occidental Petroleum Ltd. and BP for use in the North Sea.

In other activities in the U.S. since 1978, the U.S. Navy's *Turtle* one-atmosphere submersible has been refitted with a titanium hull that will increase its operating depth to 3,048 m. What was originally a twin vehicle, the *Sea Cliff* is scheduled to be refitted with a titanium sphere that will increase its depth capability to 6,000 m, enabling the Navy to retire the bathyscaph *Trieste II*. Details on the *Sea Cliff* conversion in *ST* for Sept. 1980, page 27.

West Germany

In 1979 Bruker Meerestechnik GmbH, Karlsruhe, West Germany completed the *Mermaid VI A* and is building the sister *Mermaid VI B*. Two more, the C and D versions, are being constructed with one due this month and the other next year. They are battery powered and capable of operating to a depth of 600 m. There are three interconnected spherical pressure hulls. The forward one is a one-atmosphere transfer chamber and the aft carries auxiliary equipment. They can dry transfer to 600 m and lock-out to 300 m.

Remote Control Undersea Pingers

Model N30A50 remote control underwater pingers are designed for emergency signalling and recovery of submerged manned or remotely operated vehicles; pingers operate to 6,000 m; 37 kHz signal emitted on command or by loss of power; alodyned aluminum or stainless steel; pulse widths and repetition rates can be varied. Dukane

Trieste Could Not Find RUWS

In June of this year *Trieste II*, owned and operated by the U.S. Navy, dived to 4,572 m off the west coast of the big Island of Hawaii. It was trying to locate the remotely controlled vehicle RUWS (Remote Underwater Work System) that had been lost on a test mission. *Trieste II* found that the bottom was strewn with Trieste size boulders which masked the possibility of locating the RUWS on the CTFM sonar. The mission was scrubbed. There is a possibility that an attempt will be made to make a photo-mosaic using the towed vehicle *Angus* of the Woods Hole Oceanographic Institution.

IUC Submersibles Available For Work in Gulf of Mexico

IUC Gulf, Inc., a subsidiary of International Underwater Contractors, Inc., City Island, N.Y., has based its 300 m manned submersible *Mermaid II* in the Gulf of Mexico, supported by the 44 m support vessel *Aloha*. In addition, IUC's TUSS (Tethered Underwater Survey System) which can be operated remotely to water depths of 366 m, also is available in the Gulf through the company's Houston office. □

Dive Described . J.S.L. II. (U.S.A.)

Here is a description of a diving mission.

In the forward sphere of the submersible are the pilot and an observer who monitors dive parameters along with the pilot. In the rear compartment are a diver and a tender (also a HBF diver) who handles the umbilical cables and monitors the life support system during the course of the dive.

Pre-dive Procedures

After the submersible reaches the bottom, the pilot asks surface control for permission to flood the diver's bilge (to compensate for the weight loss of the departing diver) and the dive ballast tanks. When permission is granted, the tender opens a valve to let in seawater until the bilges are full. This is easy to determine since the floor of the diver compartment is plexiglass. Simultaneously the pilot opens a valve and floods the dive ballast tanks with seawater. At the depth of 225 feet, with more than 6 atmospheres of outside pressure working on the submersible, flooding bilges and ballast tanks takes less than one minute, and 688 pounds of seawater are taken aboard.

The diver begins suiting up, assisted by the tender. His gear includes a wet suit, Kirby-Morgan mask, bail out bottle on his back, and extra weights on his belt to aid him in walking around on the bottom.

When the diver has suited up he checks his communications with the pilot. The tender hears the diver's voice for the last time until he returns to the diver compartment at the conclusion of

pilot half of the conversations with the diver outside the sub.

Diver Out

The tender asks the pilot (and through him the surface) for permission to pressurize. When granted, pressurization is carried out at the convenience of the tender. Before pressurization begins, the tender secures the fan, O_2 bleed, CO_2 scrubber, and undogs the "A" hatch leading to the seaward side of the manway, reviews the dive length with the diver and reminds him to carry out the lift test when he exits the sub. The tender notifies the pilot that he is ready to pressurize and send the diver out, on the pilot's count. He tells the pilot (relayed to the surface) "30 seconds to blowdown. . .15 seconds to blowdown. . .5, 4, 3, 2,. . .blowdown."

The surface has been counting with the pilot and tender for the final five seconds to synchronize watches. At "blowdown" the tender opens a valve to pressurize the diver compartment, and maintains the rate of 100 feet per minute, which is about 2½ minutes at the *Monitor's* depth. Keeping an eye on his stopwatch and depth gauge (also monitored by the observer and pilot) the tender continues to pressurize until the "A" hatch drops automatically. The diver jumps into the manway and kicks the hatch door the rest of the way open. Pressurization continues a small amount beyond outside pressure, to lower the level of water in the diver compartment floor.

When the diver is standing on the bottom he tries to "lift" the sub. If he can do so with little effort, the sub is too light and would have to be further ballasted. He reports to the pilot "Lift test complete," and proceeds with his dive. The pilot passes the word to the surface, "The diver is out."

As the diver does his work, he is observed by the pilot and observer, and fed his umbilical by the tender. Tender, observer and pilot all monitor gas supply. Two gas tanks each have 2,000 pounds capacity. On the *Monitor* dives, to pressurize at 225 ft., 700 pounds were used each dive with the mix being 87½% helium and 12½% oxygen.

Return to Surface

When the diver is ready to return to the sub, the pilot notifies the tender that he is on his way back in. The tender reels in the umbilical so it will not become entangled. When the

tender a rope tied to the dogs of "A" hatch, enters the diver compartment and moves clear of the manway area.

The tender pulls the "A" hatch shut with the rope, dogs it, and closes "B" hatch (in the sub's interior) but does not dog it. He overpressurizes the compartment to achieve a seal on "B" hatch, and notifies the pilot when he has accomplished this. This is easy to discern, by referring to the dive compartment pressure gauge (also monitored in the pilot sphere), insuring that it does not drop. Excess pressurization to maintain this seal is normally 5-10 feet greater than the actual depth. The seal is critical once decompression commences, for the safety of the tender and the diver undergoing decompression.

The tender now opens the same valve he earlier had opened to let in seawater, and lets the seawater out ("blowing bilges"). The pilot does the same for the dive ballast tanks. When enough seawater has left the sub in this way, the sub leaves the bottom and starts the ascent and decompression can start at any time enroute to the surface. Decompression in mixed gas dives (all the *Monitor* dives) is handled by the observer, who on lockout dives is also a trained diver and sub crew member. The tender handles decompression of air dives.

Scorpio Monitors Trials Site

The British company Sub Sea Offshore's submersible vehicle *Scorpio*, under contract to Underwater Trials Limited, recently completed monitoring the preparation of a test site at Loch Linnhe, Scotland, for current U.K. Department of Energy underwater tethered submersible assessment trials.

The vehicle, positioned in 110 m of water, monitored the installation of a 4409-kg special purpose test rig incorporating various operational tasks for tethered vehicles, and the precision laying of a jackstay to the correct heading.

Sub Sea Offshore, with the associate company Sub Sea International which now incorporates the Sonarmarine unmanned vehicle division, also operates several inspection and manipulative submersibles including TROVs, TRECs and RCV 225s.

Cable-controlled unmanned vehicles

Perhaps the most outstanding development in this category of vehicle has been the progress made by the Canadian company International Submarine Engineering Ltd (ISE), (formerly McElhanney Offshore Surveying and Engineering Ltd) in their sales of *TROV* (tethered remotely operated vehicle) and *TREC* (tethered remote camera) vehicles. Up to April 1979 eight *TROV* and nine *TREC* units had been sold to Canadian, American, British and French companies, the first *TROV* prototype having become operational in April 1975. ISE have now developed a further underwater vehicle, the *DART P*, and it is understood that orders have already been received for this very much smaller vehicle which weighs only 32kg (70lb). Through the development of the ISE underwater vehicles it is apparent that the market requirements are being met successfully and that they are obviously encroaching on areas of operation previously undertaken by manned submersible/diver systems.

The lead established by ISE and indeed by Hydro Products and Perry Oceanographics Inc in unmanned vehicles is being rapidly followed by a number of other companies. In the United Kingdom, Sub Sea Surveys Ltd have built the first *Ize*, a television inspection vehicle weighing only 140kg (308lb). Another new vehicle to be produced is the *Telesub 1000* by Remote Ocean Systems Inc of San Diego, which has an operating depth of 610 m (2,000 ft).

Smaller vehicles are the Italian *UTAS 478* and the *Filippo* equipped with television cameras, and the Marine Unit Technology Ltd *Smartie* which carries an onboard micro computer enabling the vehicle to be held in position in variable current conditions and the vehicle operator to be able to follow on his video screen an artificial navigation "target" in waters of zero visibility. Another interesting feature of *Smartie* is that the propulsion of the vehicle employs a centrifugal pump feeding six outlet nozzles; the use of conventional ducted propellers with their entanglement problems has been avoided. A Soviet cable-controlled underwater vehicle, *Scat*, was announced in the past year, a relatively heavy vehicle at 10 tons, powered by 4kW batteries and operated in conjunction with the Soviet *Argus* submersible.

Seabed vehicles and habitats

1978 saw the British UDI Group Ltd seabed vehicle *Seabug* in operation in the Gulf of Mexico. Capable of undertaking visual inspection of pipelines, buried pipe tracking, trench profiling and depth of burial measurements, the vehicle is now expected to be used in northern European waters. Possessing good traction on the seabed, it offers safe working mobility in close proximity to underwater structures and this feature, combined with a continuous surface power supply, presents a useful alternative to divers or manned submersibles. The Irish Winn *Tramp* vehicle is believed to be in use by Submersible Television Surveys of Aberdeen. Little other activity in the field of seabed vehicles has been reported.

The underwater habitat activity has also been very quiet and the hoped for *Oceanlab* habitat project in the United States has failed to materialise.

International Submarine Engineering (ISE) of Vancouver, British Columbia, has formed a United Kingdom based subsidiary, International Submarine Engineering (UK) Limited to provide a comprehensive sales and service operation for the company's range of submerisbles, underwater equipment, systems and instrumentation.

The new company will sell and maintain the TROV, TREC, and DART submersible systems currently in operation offshore with Solus Ocean Systems, Sub Sea International, Sonarmarine and Intersub, and be responsible for the European introduction of the TRUCS heavy duty underwater construction vehicle the WRANGLER atmospheric diving suit, and the ARCS system, an autonomous submersible design, as they become available.

A new submersible manufacturing company has started its operations.

The new company is registered under the name of **Scandinavian Underwater Technology Corp** (SUTEC) and will be operating from Linkoping, Sweden, where the company has good access to a variety of technical specialists at the Aerospace Division of Saab-Scania.

Personnel involved in the recently closed down Saab-Scania project, the development of a highly advanced unmanned remote controlled tethered submersible called the Saab-Sub, has now taken over some parts of the Saab-Scania underwater technology programme.

SUTEC will as a start manufacture a commercial version of the small observation vehicle Saab-Scania originally developed for testing purposes only. This unmanned remote controlled observation vehicle will be named the «Sea Owl.»

The Swedish Ocean Industry Group, Swedocean, has been founded.

Swedocean is a group of Swedish companies engaged in the development, manufacturing and marketing of products and services within Ocean Technology or in the exploitation of natural resources in the ocean and under the ocean floor.

Underwater 'helicopter' may aid in the search for Titanic

Jan 81

MIAMI (UPI) — The search for the sunken ocean liner Titanic may get help from an underwater "helicopter" next summer.

Miami inventor Fred Koehler Jr. and Texas oil millionaire Jack Grimm have agreed that Koehler's helicopter-shaped submarine might be used in the search next June if it tests satisfactorily this winter.

Grimm financed an expedition last summer which spotted what might be the wreck of the Titanic in 12,000 feet of water 380 miles off Newfoundland.

Grimm plans to go back to take a closer look at what he thinks is the liner, which went down with 1,500 people aboard after it hit an iceberg April 15, 1912. And he says Koehler's "Seacopter" might the provide the means.

The two met recently in Abilene and Grimm came away impressed.

"It fascinated me," Grimm said. "I think it does have considerable potential. Of course, he needs to work the bugs out of it. I sure want to see it tested."

Koehler, who owns a television and repair store, says he has been developing the two-seat vehicle for 10 years, working when he had the money, stopping when he didn't.

The Seacopter is a sphere seven feet in diameter with a hydraulic propulsion and steering system sticking out the back, making it look like a helicopter.

Still incomplete, it will have mechanical arms and tank treads that will roll along the bottom when it is not maneuvering in the water like a submarine at speeds up to eight knots.

The arms would make it conceivable for the Seacopter to cut a whole in the hull of the Titanic, and then roll on its treads down a passageway to the ship's safe, said to contain a fortune in jewels.

Undersea Minerals To Be Mined

New York Times News Service

WASHINGTON — The equipment for mining manganese and other valuable minerals from the ocean bottom has been patented for Lockheed Missiles & Space Co. Inc. Tests have been conducted in the Pacific Ocean at depths of 15,000 feet.

Patent 4,232,903 was granted last week to Conrad G. Welling and six other Lockheed employees.

The equipment includes a ship that provides control and an ocean bottom vehicle that picks up the manganese nodules, washes and crushes them and sends the slurry up a pipe to the ship. A nodule is a lump about two inches in diameter, which besides managanese contains copper, nickle, cobalt and traces of other minerals. Manganese is used in steel production.

The nodules were discovered more than 100 years ago, but recovery by dredging proved difficult. The self-propelled ocean floor vehicle is maneuvered by controls aboard the ship.

Sonar and television cameras monitor the vehicle's position and the topography of the region. The depth to which the pickup rake penetrates the ocean bottom and the size of the nodules collected are regulated.

The mining system has been developed in 15 years of research by Lockheed and other companies. Experimental operation was conducted a year ago under controls from the Glomar Explorer, a ship chartered from the government. Decisions on commercial operations are expected to be delayed until conclusion of negotiations by the United Nations Law of the Sea Conference, to be resumed next March.

PRC Wants Rescue Submersible

During a recent visit of a delegation of Peoples Republic of China scientists and ocean engineers to the U.S. west coast the Chinese let it be known that they were interested in a submarine resuce submersible.

The U.S. has two such vehicles, the Deep Submergence Resuce Vehicles *Mystic* and the *Avalon*. Each one can operate to a depth of 1,525 meters. They are capable of being airlifted in a C-5A aircraft and being carried to the site of a submarine sinking piggyback on a mother submarine. Each has three pilots. By mating with a downed sub each can carry 24 resucees to safety.

The PRC delegation asked whether they could see the DSRVs. After consultation with Navy headquarters in Washington the request was denied. No reason was given, but the best guess is that the two vehicles embody technology that the Navy considers exclusive and shouldn't be divulged to a communist nation.

Harbor Branch Submersible Aids in Georges Bank Study

Working in weather familiar to habitues of the Georges Bank area, where the ship's bow often cannot be seen from the stern, Harbor Branch Foundation, Inc., Fort Pierce, Fla., recently completed a month-long mission in pollution and marine life studies off the Massachusetts coast.

The submersible *Johnson-Sea-Link 1* made 31 dives between 80 m and 335 m, one of them a mixed gas diver lockout at 86 m, and was supported throughout the mission by the *R/V Johnson*. Two weeks' work was done for the National Marine Fisheries Service, Woods Hole, Mass., implanting five Helle pingers to mark a pre-selected area that, because of current patterns, could be susceptible to damage from potential oil spills after Georges Bank drilling begins next year.

Marine organisms such as lobsters were captured as a control group of organisms, to be compared to others to be captured during subsequent years, for effects of pollution that may follow commencement of drilling. The study will continue for at least five years.

The last leg of the three-part deployment involved photographic documentation of tile fish for Rutgers University, roughly in the same area of Georges Bank. This segment of the mission caught bad weather that had not materialized for the first two weeks. In the latter period, three of seven days were "weather" days, where waves of up to 3.7 m made submersible operations impossible. □

Research ship back after successful first phase of storm probing experiment

STREX test for Parizeau

By Ab Kent

The research ship Parizeau came home Thursday after three weeks of buffeting by North Pacific winds of up to 60 knots while setting out instrument buoys for phase one of an international storm study.

The results of STREX — the Storm Transfer and Response Experiment — may be useful in deciding how best to replace the aging Canadian weatherships Quadra and Vancouver which are due to be laid up next year.

The rough conditions caused one casualty — ship's cook Lloyd Clarke — regarded by the Parizeau's crew as one of its most important members, said chief scientist Stan Huggett, of the hydrographic section at the Institute of Ocean Sciences.

Huggett said Clarke was thrown to the galley deck during the first week and was laid up for the rest of the voyage with a cracked pelvis and pulled muscles.

But Clarke's young assistants Stephen Dickinson and Greg Mitchell carried on, Huggett said, and the crew of 32, four technicians and two scientists ate well during the assignments.

Oceanographer Bill Large, a Canadian graduate of the University of B.C. and now with the National Centre for Atmospheric Research at Boulder, Colo., said he is pleased with results of the experiment so far.

"The raw data looks good, the buoys are all working, and time will tell," Large said.

A total of 16 buoys — six Canadian and 10 U.S. — were deployed in a 60 by 120 kilometre area of the ocean known for its storms at this time of year.

The buoys are relaying oceanographic data via satellite to land stations where it is recorded for analysis and supplied to the global meteorological forecasting network.

But Large said the main reason for STREX is to learn how the atmosphere exchanges energy with the ocean to cause the storms that lash the Pacific coast with rain and wind and create many of the continental weather systems.

"The mechanics of water transfer from the upper ocean layers into the atmosphere will be recorded for the first time over a period involving high winds," Large said.

At the same time, temperature profiles of the ocean to a depth of 120 metres will also be recorded on a routine basis during a storm period.

The ship will be taken out again Monday by master Eric Fisher for a nine-day voyage to lay six more buoys in the test area around Ocean Station Papa, 1,500 kilometres offshore in the Gulf of Alaska.

The U.S. research ship Oceanographer is also making two voyages, returning to Seattle Nov. 22 from the first and going to sea for 13 days Dec. 1.

Also participating in STREX is the weathership Vancouver, as well as six aircraft.

The buoys are specially-made, battery-powered fibreglass packages worth between $8,000 and $16,000, depending on their instruments.

They are designed to measure temperature, salinity, currents and barometric pressure.

Their drift is tracked by the satellite automatically when it receives data from each buoy's transmitter.

Oceanographer John Garrett said the buoys are expected to drift for at least four months in the gulf unless they are washed ashore anywhere between Juan de Fuca Strait and the Alaskan coast.

They will continue to transmit data as long as their batteries — they have a 12-month life span — hold out.

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

APRIL, 1981

Vol. XV, No. 2. Published by the Deep Submersible Pilots Ass,n

The Deep Submersible Pilots Association was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in orded to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to:

Robert K. R. Worthington Editor and Secretary, DSPA 3005 Curie Street San Diego, CA 92122 (714) 453-1158	or	Donald E. Saner President, DSPA 4707 Berwick Drive San Diego, CA 92117 (714) 278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman & Vice-President, DSPA
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

I am sure all hands will join me in welcoming the reinstatement of Don Keach, Jean-Marc Plancon, and Larry Shumaker. A hearty welcome on board is extended also to Rich Barker (Lockheed DEEP QUEST), Mel Wills (Lockheed DEEP QUEST/TRANSQUEST), Tom Gazdik (IUC PISCES VI), John Dryfka (O-in-C DSRV AVALON), Pete Traphagen (NEKTON's), and Bill (Stretch) Leonard (ex-TRIESTE II)-a former Member returning on board.

Jack Bennett is now predicting departure of the tug CLIFFTON with AUGUSTE PICCARD in tow from San Diego to the Canal "someday this week". This is the 13th, and we are counting! Truthfully, we have enjoyed their enforced addition to our San Diego coterie this past year, painful as the repeated delays have been to Jack.

Alan Whitfield is a strong candidate for the title of "Busiest Member" with his activities in connection with the IUPA and the MANTIS project , to which he has now added "The Submarine School". See his letter in this issue.

SECRETARY'S REPORTS AND NOTICES

Embroidered DSPA badges, suitable for wear on caps, jackets, etc., are now available for US$2.00. Order from Worthington or Forman. They are 3" in diameter. Forman also has DSPA T-shirts for US$6.00.

Annual dues are now due and must be paid by 30 June. USA/ Canada addresses--US$ 10.00, overseas addresses--US$ 15.00. PLEASE PAY UP PROMPTLY, IF YOU HAVE NOT ALREADY DONE SO!

DSPA San Diego Luncheon Meetings were held at Tarentino's as follows:

1/12/81

Members Present
Don Saner
Bob Worthington
Doug Privitt
Alan Smith
Jack Bennett
John Schiltz
Chris Landrum
Jerry Shiller
Tom Vetter
Will Forman

Non-Members Present
Mel Wills-TRANSQUEST
Rich Barker- "
Ken Privitt-NEKTON/MARFAB
Pete Traphagen-NEKTON

Bob Worthington announced the results of the election of DSPA officers, relinquished the presidency to Don Saner, and welcomed Alan Smith as a new Member.

Jack Bennett reported Horton Maritime has purchased another tug (the CLIFFTON) for AUGUSTE PICCARD in Vancouver and will dispose of their lemon, the ADAK. They now hope to sail from San Diego within a month.

Pete Traphagen and Tom Vetter reported on NEKTON's search last weekend for the private aircraft which crashed in the ocean off Oceanside recently. With 2' visibility and considerable surge near the bottom, NEKTON's search effectiveness was greatly hampered. They believe the target was located by the support ship's sidelooking sonar, but the search was terminated before identification by NEKTON.

Chris Landrum described the harrowing events after a mooring pylon failure near where he was working in the Garoupa Field off Brazil in October.

Will Forman was prepared with DSPA T-shirts for sale.

Next luncheon date was set to be 19 February.

2/19/81

Members Present
Don Saner
Bob Worthington
Will Forman
Jack Bennett
Chris Landrum
Jerry Shiller
Rich Barker

Non-Members Present
Dave McCafferty-Searle Consultants
Bill Leonard- ex-TRIESTE II

Rich Barker was welcomed on board as a new Member.

Will Forman showed the new embroidered DSPA patches now on sale for US$ 2.00.

Jack Bennett stated the PICCARD is now scheduled to sail from San Diego in March. The tug CLIFFTON is still at Vancouver, the Canadian authorities having jailed three of Jacks crewmen for loading stores without alien work permits.

Jerry Shiller reported the NEKTON support ship SEAMARK undergoing overhaul and modification at Harbor Boatyard in San Diego.

Forman reported an application for membership on the basis of JIM suit operations. Consensus was for rejection of the application unless other applicable experience could be shown since JIM characteristics are those of a tethered diving suit, not those of a deep submersible.

Next meeting date was set as 12 March.

3/12/81

Members Present	Non-Members Present
Don Saner	Lt. Rich Luke-DSRV MYSTIC
Bob Worthington	CPO Bob Martin-ex-MYSTIC
Ron Rau	Lt. Pat Baccei- DSRV MYSTIC
Doug McKinney	Bill Leonard-Path Research
John Dryfka	
Jack Bennett	
Alan Smith	
John Schiltz	
Don Rosencrantz	
Will Forman	
John Cameron	

Jack Bennett reported their tug CLIFFTON has arrived at San Diego and should depart for Mobile, Alabama , by 30 March with PICCARD tow.Jack asked that all hands broadcast that he (Gulf Maritime) is looking for experienced personnel to make up a second crew for the AUGUSTE PICCARD. The crew must be capable of manning and maintaining both the submersible and the support vessel as an integrated team.

Don Saner reported DEEP QUEST as presently inactive but anticipating projects for testing of a thermoelectric cooling system and fiber-optics TV.

John Cameron announced that TURTLE was at sea on TRANSQUEST and was to take Walter Cronkite for a dive today.

John Dryfka described forthcoming operations fo the DSRV's, including development of a tow capability for use in the eventuality of an essential water movement without the availability of adequate surface ship lift or a properly configured mother sub at hand.

Next meeting will be on 16 April.

LETTERS FROM MEMBERS

Richard Otter-SEA OTTER (3/13/81)
"The enclosed article is one that answered a few questions that I've encountered on two different occasions. On both dives,with different passengers and six months apart, my passengersappeared to have hypoxia, one in a mild state and the other degenerating into cyanosis and drowsiness. The initial symptoms were accelerated talking,nervousness, and shortness of breath. It wasn't the normal nervousness after several hours which can usually be dispelled by urination. With the initial symptoms, it of course caused me to go throughthe the rudiments of checking 02, CO2, et al, but to no avail. He was stuck on 02 which cleared it up. The atmosphere was clean of CO2, CO, and seven other gases that were checked. Existing 02 was at 19.5 %. I did note beforehand that asperin and Bufferin were taken for a headache. You will probably note that excessive buffers will certainly cause the above. I think all concerned will find the article interesting if not useful."

(Ed Note: Referenced article, "Clinical Hypoxia",appears in "Critical Nurse Care", Nov-Dec 1980, pp. 21-29. Interested Members may borrow from me.)

Alan Whitfield-HMB Subwork (3/16/81)
"Please find enclosed the January 1981 IUPA Newsletter. Sorry for the delay in sending it to you. I am still running the MANTIS 004 project on the drill rig "Borgny Dolphin" in 1100 feet off Norway. We recently cleared, cut, and recovered over one thousand feet of guidewire which had broken off and entangled the B.O.P. In addition to the MANTIS project, I have also opened an adventure sport school at Brighton Marina. A colleague and I have obtained two Kittredge K-350's. We offer the general public one-day "have a go" submersible courses and two-day "basic" courses. Brochure enclosed."

Kevin Parker-Oceaneering International(3/21/81)
(Phoned from Scotland to enquire about dues, T-shirts, and badges. "Still busily engaged with ARMS and RCV's."

Irene Fager-ONE HALF FATHOM (4/10/81)
"Just wanted you to know that your recruitin efforts for OHF paid off. We have 134 paid at this time. We're still shooting for 150, but we can exist on 134. Please give my best to all and tell them I still remember the men in the little subs in my prayers."

THE SUBMARINE SCHOOL

LOCATION

The Submarine School is situated at the western end of the Brighton Marina, which is approximately one mile east of Brighton town centre. The Brighton Marina is the world's second largest, and offers a wide range of high quality facilities. The Marina is divided into an outer and inner harbour. The outer harbour is tidal, while the inner harbour is shut off from the sea by a modern fast acting lock. Two breakwaters made up of 110 caissons (each equivalent to a four-storey house) enclose a total area of 126 acres, and provides berthing space for some 2,200 boats.

THE BRIGHTON SUBMARINE SCHOOL

The Brighton Submarine School is one of only two such organisations in the world. (The other being located in Maine, U.S.A.) The School at present operates a Kittredge K–350 one man – one atmosphere submersible, with a second awaiting delivery from America. The K–350 submersible is ideal for student training as it is very simple to operate, has excellent manoeuverability and mobility, and is extremely safe. The School instructors are experienced commercial divers, and deep submersible pilots; who have operated in the North Sea, Norway, Iceland, and the Mediterranean. They have dived a wide variety of submersibles, ranging from the 2-man "Pisces", to the large 5-man diver lockout "Perry PC–15's" and "Taurus".

THE SUBMERSIBLE COURSE

The School offers a two-day course, which is held at weekends or midweek (depending on student preference). These courses are conducted during the summer from May – October. Advanced courses arranged on request. The cost of the two day course is £69.00.

All students attending the school must be over 18 years of age, and are required to produce a medical certificate.

The course price includes the use of all course equipment. However, students are requested to bring suitable clothing to wear during the day. (Gym shoes, jumper, jeans, water-proofs.)

THE TWO-DAY COURSE PROGRAMME

Day One 0900hrs Reception, Introduction and safety lectures. (Classroom).
Introduction to the K-350, use of the submersible systems, pre-dive checks. (Jetty area).

Diving instruction, use of submersible systems underwater. (Submarine dive zone).

1700hrs Post-dive checks, debrief. (Jetty area).

Day Two 0900hrs Preparation and brief for "open water dive". Motor on the surface from the Brighton Marina to the dive site. (This dive site will depend on weather and tidal conditions).
Open water diving in the K–350 submersible.
Return to Brighton Marina.

1700hrs Post-dive checks, presentation of course certificate. (Jetty).

THE K–350 SUBMERSIBLE

Since 1967 Kittredge Industries have built over 30 submersibles, which are used by many different organisations, for various underwater tasks.

PHOTOGRAPHY
VIDEO SURVEYS
SEA BOTTOM RESEARCH
MID-WATER SURVEYS
PIPELINE SURVEYS
MARINE LIFE SURVEYS
WRECK SURVEYS
SALVAGE
DIVER SUPPORT OPERATIONS
UNDERWATER LEISURE
UNDERWATER HABITAT SUPPORT
SUBMARINE SCHOOL

TECHNICAL DATA K – 350

Length : 11ft 5 ins
Height : 5ft 10ins
Width : 4ft 8ins
Crew : One
Depth : 350ft (Max operating)
600ft (Test depth)
Speed : 4 knots
Weight : 3500lbs (in air)
Propulsion : 3 x electric motors
Power source : Lead/acid batteries
Ballast system : Air/Water. Three ballast tanks
Communications : UQC (through water) 22Khz, 10 mile range
Lighting : 2 x external lights
Viewports : 1 x main 16" front port
4 x 6" ports
Navigation : Depth gauge, magnetic compass
Surface marker buoy.

CONDITIONS OF BOOKING

Students are liable for the full payment of course fees unless cancelled more than 28 days before the course was due to commence when the balance due will be waived.

Reservation Terms – A deposit of £25 of course fee is payable on booking. The balance is due 14 days before the commencement of the course.

The Submarine School reserves the right to cancel any course. In such a case all fees will be refunded unless alternative dates are offered and accepted.

No fees will be refunded unless as stated above.

The school reserves the right to increase fees without notice, but the fees ruling at the date of acceptance of a booking will be honoured and no subsequent increases passed on.

All students must be 18 years of age or over and must produce a medical certificate.

ACCOMMODATION

Overnight accommodation and food, is not included in the course fee. However, Brighton has a wide variety of accommodation and restaurants available to suit your tastes. In addition the Marina provides a floating restaurant, bar and yacht club. There is also a caravan and camping site nearby.

THE TOWN OF BRIGHTON

The town centre is just over one mile away, and can be reached by a regular town bus service. Also a few minutes walk from the Marina's west cliff entrance is the "Old Volks Railway", which connects the town to the Marina. (A train runs every quarter of an hour or so in summer.)

Brighton is famous for the "Lanes" with small antique shops; the Royal Pavillion, and the new Conference Centre. There are excellent restaurants, shops and hotels of all categories. During the evening, there is a wide selection of cinemas, discos, night clubs, a casino and the Theatre Royal to choose from.

TRAVEL TO BRIGHTON

By road	A23 (M)
By rail	Intercity : from London (Victoria) 55 mins.
By air	Gatwick Airport 27 miles Brighton Airport 7 miles
By sea	Private boat Seajet Service – Brighton Marina to Dieppe – 100 mins.

INFORMATION

For further information contact : THE SUBMARINE SCHOOL, c/o 4 HAPSTEAD COTTAGES, ARDINGLY, WEST SUSSEX or telephone :

HAYWARDS HEATH (0444) 892066

UNIVERSITY OF SOUTHERN CALIFORNIA
Institute for Marine and Coastal Studies
UNIVERSITY PARK • LOS ANGELES, CALIFORNIA 90007 • (213) 743-6104

Office of the Director

28 January, 1981

Robert K.R. Worthington
Editor and Secretary
Deep Submersible Pilots Association
3005 Curie Street
San Diego, California 92122

Dear Bob:

Here's my contribution for next year's dues. Don Keach tells me that he got brought back into the DSPA during a recent visit to San Diego so I guess the two of us are again members in good standing.

Don and I just finished a small training program for the Japanese test crew of the SHINKAI 2000 submersible. This 6000 foot boat is being built by Mitsubishi Heavy Industries in Kobe for the Japanese Government. Through our consulting company, International Maritime Incorporated, we obtained a small contract to set up a classroom and diving program at St. Croix, U.S. Virgin Islands. We went there in order to use ALVIN, which happened to be operating out of St. Croix in January, 1981. DSPA member, Larry Shumaker, was our chief instructor for the program. We subcontracted for his services from his company, Interstate Electronics Incorporated.

The program went well and each of the MHI people (there were 3) got plenty of 'hands on' time with ALVIN and at least 2 dives.

SHINKAI 2000 is completed and the crew has made some 27 'immersions' in the building shed. They constructed a large tank, filled it with fresh water, and have been going through preliminary tests in this very controlled environment. The water is deep enough to cover the submersible and this allows them to go through most of the check off procedures and systems tests. Next it will go into a large drydock at Kobe for 'dives' to about 30'.

It looks like a good boat. Don, Larry and I visited the MHI Kobe works last fall and it was virtually completed at that time. We will make another visit in March 1981.

Best wishes,

Don Walsh

BRITISH OCEANICS IS THINKING DEEP

The creation of a large state-owned British submersible fleet was completed last year when British Oceanics bought up the fleet of its major competitor, Intersub. Intersub's operations had been foreclosed by two banking groups, which forced the sale of its assets. These assets, added to the British Oceanics fleet, gave the UK National Enterprise Board (NEB) majority ownership of the largest fleet of industrial submersibles in Europe, or even the world.

British Oceanics, was part of the Vickers empire which crumbled early in 1979, and was then taken up by the NEB.

Norman Smith, who recently became managing director of holding company British Underwater Engineering, attributes the decline and fall of Vickers to an over-investment in diver-lock-out from submersibles. This was a heavy capital investment which, another BUE man pointed out, was based on a single exceptional year of trading.

Diver-lock-out from a submersible proved to be difficult to justify, because dynamic positioning of a support ship linked by an umbilical to a diving bell was generally cheaper.

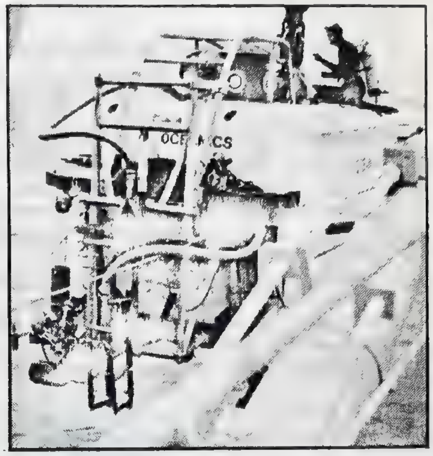
Sidney Freeman, BP Engineering, estimated at the Underwater Technology conference in Bergen last year that diving bell usage as a percentage of total contract time worked out at 22.32% as opposed to 14.8% for lock-out, according to comparative tests made on two systems in 1978. Operational cost effectiveness (average daily hire rate divided by average daily inspection hours) came to approximately £3,750 for a bell system and £5,500 for a submersible.

Partly because of the implication of such statistics, Intersub was liquidated in 1980 and Oceanics was restricted to a single diver lock-out contract (using Comex divers) last year. Dynamic positioning and bell systems have almost swept the board clean.

According to Norman Smith, deep water operations are the major expected growth area for Oceanics, although rapid pipeline surveys still provide a lot of bread and butter work for the submersible fleet. Some of the new contracts for Oceanics relate to deepwater operations, with three of its submersibles doing support work for the Trans-Mediterranean Pipeline Company, while rescue repair and burial of damaged American Telephone and Telephone and Telegraph cables in the Bay of Biscay at 140m also kept Oceanics busy last season.

Like other diving companies, Oceanics has suffered from a slump in offshore construction work for the last two years.

Oceanics has recently completed placement of transponders and finished site surveys at 117m for Occidental's development of South Claymore, which requires accurate placing of a bottom drilling template. A relative accuracy of 1m in positioning the transponders between the two pipelines was claimed. Prior to this job, which took 10 days, the submersibles *L-1* and *L-2* operating from *British Viking* completed subsea construction and inspection contracts for Shell on Cormorant and Brent fields and the FLAGS trunkline.



Launching the Taurus, one of the world's largest commercial submersibles, into the Bay of Biscay, where British Oceanics laid 2.4km telephone cables late last year.

The 'crochet hook' water jetting equipment designed by Vickers Offshore which was used by British Oceanics to lay the telephone cables.

Last season the company used submersibles fitted with Slingsby-designed manipulators to remove anchor lines draped across the Texaco Tartan pipeline. Now the company looks likely to be doing the support work on the flowlines to be installed on Tartan. Where work in the North Sea is available, Oceanics seems to be getting it.

With an over-supply of submersibles in the North Sea, a price war was waged which put Comex and P&O submersibles out of business two years ago. While British Oceanics is based on NEB's money as well as private capital, the political climate has changed and the government might not have been prepared to finance a new price war between Oceanics and a new rival buying up the Intersub fleet.

With both fleets inside Oceanics, the situation whereby companies were bidding below cost merely to stay in work now appears to have ended. Oceanics also claims to be able to tender more efficiently with a wider choice of vessels.

The NEB did not bear the whole cost of the £4 million charged by First National Bank of Dallas and Transunion Leasing for the sale of the Intersub fleet. Two million pounds was raised on the stock exchange through the North Sea Assets company, while Brown Root retains a 10% interest.

The purchase of the Intersub fleet gave Oceanics a further 10 submersibles and five support vessels to add to its own fleet of nine submersibles and three support vessels.

This probably increases the number of support vessels to over-capacity, given the aim of fitting the size of each submersible to a specific job. Oceanics is now converting the older Vickers support vessels *British Vanguard* and *British Viking* into seismic survey boats for which, apparently, they are well suited. *British Voyager* will be retained since it is the only vessel capable of operating as a support ship to the very large submersible *Taurus*, used for cable burial but claimed to be the only commercial submersible capable of rescuing submariners from vessels trapped at depth.

Last year BUE moved into the remote controlled vehicle (RCV) market, buying up its first non-Vickers company, Sub Sea Surveys, in May 1980, divested to the NEB by Peckston shipping agency.

Sub Sea Surveys, a very profitable venture, runs several spreads, *Consub 2*, an *RCV 225* (eyeball) system and a newly-designed *IZE*, which is a small RCV designed and developed by Sub Sea Surveys with pan and tilt wide angle TV, thallium lighting and four thrusters.

Consub 2 has been uprated recently, with Sub Sea Surveys claiming 'insignificant downtime caused by equipment and systems malfunction'. New equipment for 1981 includes a 'three-gun' colour TV and five camera system for single pass pipeline surveying.

Contracts for *Consub 2* logged 111 days last season, with repeat surveys of BP's Forties line, Shell's FLAGS line, site and route surveys for Marathon's Brae field, Frigg line inspection for Total, site survey for Shell's Cormorant platform, and wellhead and flowline inspection for Mobil on Beryl field.

The *RCV 225* system did 3,500 diving hours for Comex-Houlder, working from the semisubs *Uncle John* and *Treasure Finder*. The *IZE* RCV is now being used on a long-term contract for pipeline and platform survey, diver monitoring and drill rig support on Shell's Brunei field.

NEW SURVEY SYSTEM

Morgan Berkeley, part of Norcem's Corrintec Group, has completed pipeline corrosion surveys on the Forties and Frigg fields, using a new system for the collection of protection potentials and current densities.

The contract, placed by Sub Sea Surveys Ltd (SSS) of Barrow-in-Furness, utilised SSS's Consub 2 tethered submersible, operating from the mothership MV Inspector, to carry out on-line corrosion surveys of BP Petroleum Development Ltd's 20in feeder lines on the Forties Field from Platforms A, B and D to Platform C and parts of the 106 mile 32in line from Platform F.C. to Cruden Bay, Scotland.

Similar potential monitoring surveys have also been carried out using the new system by Subsea Surveys for Total Oil Marine Ltd on a total of 20 kilometres of line including two 5 kilometre stretches from platforms TP1 and TCP2 and two separate sections of the same lines approximately 90 kilometres from the landfall at St. Fergus.

The corrosion survey system, developed by Morgan Berkeley over a three year period, including extensive operational trials in the North Sea, consists of a probe with sensitive matched electrodes mounted on the Consub 2, a topside monitor with multiple digital volt meters (DVM's), a remote electrode mounted on the umbilical cable, and an information print-out capability.

The company claims that the new subsea survey system is unique in that it is capable of obtaining cathodic protection potentials, as well as current densities, from a single probe.

Morgan Berkeley and Co Ltd, E mber House, Moorside Road, Winchester, Hants. **Tel: 0962 69622.**

Slingsby Engineering Ltd, the design and manufacturing arm of British Underwater Engineering Ltd, has introduced several major equipment developments, including the one-man vehicle OMAS, which is now successfully operated by Wharton Williams Taylor; the JAMES manned, atmospheric diving suit with a working depth to 2000ft and an equipment outfit tailored to the needs of the operator; a mid-water platform inspection ROV nearing completion at Kirbymoorside factory for Sonarmarine, equipped with two of the latest type UT 004 electro-hydraulic manipulators developed by SEL; and a seabed crawler is under construction with midwater capability, which can be fitted with cable tracking equipment, trenching tool and manipulator.

Sub Sea Surveys/BUE

British Underwater Engineering Ltd has acquired an 86.6 per cent holding in R H Chapman (Sub Sea Surveys) Ltd to extend and complement the submersible services of British Oceanics Ltd. Roger Chapman will continue as managing director of the company which was valued at £1 million for the acquisition.

B.O.L. FOR SHELL

British Oceanics Submersibles L1 and LR2, working from the mothership British Viking, have completed a subsea construction assistance, inspection and survey contract for Shell in the Brent and Cormorant fields and on the Brent system oil and FLAGS gas trunk lines.

The operations covered pre- and post-lay surveys of control and flow lines from a subsea wellhead on the Cormorant field to Cormorant Alpha; the survey of six pipeline crossover points; the positioning of transponders to assist laying; and the monitoring of pull-in operations to the wellhead and into the platform J-tubes.

Other operations included a two-submersible survey of an expansion spool-piece with repeatable accuracy of 15 centimetres relative to the seabed and to the platform, colour video survey, profiling, debris clearance and cathodic protection monitoring of specific sections of the Brent and FLAGS pipelines.

During these operations the two submersibles, part of BOL's fleet of eleven, were also deployed to carry out general visual and photographic surveys on the Brent vent structure and semisubmersible accommodation vessels.

Full details on the L1 and LR2 submersibles and these operations for Shell from British Oceanics Ltd, PO Box 215, East Old Dock, Leith, Edinburgh. **Tel: 031 554 4411 Telex: 72248.**

B.O.L. BURIES TAT. 4

British Oceanics Ltd, has completed the positioning and burial of 1.5 miles of the TAT. 4 trans-atlantic telephone cable in the Bay of Biscay, for American Telephone and Telegraph Longlines.

The operations, following cable repairs, were carried out in a water depth of 480 ft and involved the deployment of the submersibles Taurus and LR5 from the Mothership 'British Voyager' to carry out surveys and video inspections of the cable's route, the placing of transponders and the burial itself.

The contract, the second of its type completed by BOL for American Telephone and Telegraph during 1980, made use of the submersible LR5, working with Comex divers in the lockout mode, for the clearing of wires and cleaning of any rope from the cable's plastic outer covering. Taurus was equipped with a specially developed high pressure twin jetting system for the burial operations, during which, in a single dive, it buried 3200 ft of cable to a depth of 12 ins.

According to BOL, submersible bottom operating time for jetting operations is shortly to be increased by the supply of electrical power via an umbilical from the surface to eliminate surface downtime for battery charging, an innovation which could reduce further the number of individual dives required for subsea cable buriaal.

British Oceanics Ltd, PO Box 215, East Old Dock, Leith, Edinburgh. **Tel: 031 554 4411. Telex: 72248.**

The world's first operational submersible powered by a closed cycle diesel engine (CCDE) was given its first major airing at October's EEC diving safety symposium in Luxembourg. A prototype *PH-002* was photographed during sea trials (above).

The danger of harsh sea conditions to divers supported by a dynamically positioned mother ship is cited by developer Sub Sea Oil Services as the main impetus for its eight-year Phoenix project. The first such operational submersible, the 11m long × 3m high × 3m wide *PH-1000/1*, powered by two 90hp CCDEs, is ready for first work next month.

Symposium delegates heard that the 12-knot vehicle had increased the diver lock-out time from 4 hrs using a traditional submersible, to some 24hrs. The PH-1 class accommodates four saturation divers and needs a tender ship only for position monitoring and communications. It also provides a 'realistic' method of hyperbaric rescue for up to 10 divers, according to SSOS. The heat source is 'virtually unlimited', and the submersible could even be launched from an offshore structure.

The underwater industry has for years sought a self-contained solution to subsea working, and the presentation, made by Micoperi's Dr Brunner was received enthusiastically.

'There will be considerable applications for this techniques,' Cmdr Warner later commented.

Two further classes are to be introduced. PH-2 will carry 11 saturation divers down to 500m, or in atmospheric mode it could operate down to 2,000m. PH-3, more like a submarine with a 22-strong crew, is planned to handle 24 days' saturation endurance.

According to SSOS total annual inspection expenditure in the North Sea will be £106 million by mid-1980s. Nor have possible deep sea mining applications been overlooked.

1/81

To the Editor:

Your article concerning the endurance records claimed by Lockheed for the *Deep Quest* submersible (Vol.21, No. 11) was excellent and the operators of *Deep Quest* are to be congratulated for their third dive using the fuel cells. In reporting this interesting event it should be noted however that the Reynolds Metals Co. submersible *Aluminaut* in November 1965 submerged for 33 hours and transited the Straits of Florida from the Bahamas to Miami, a distance of 112 kilometers.

Bob Serfass
Former Aluminaut Captain

Saab-Sub Sold To Scandinavian Underwater Technology, Sweden

Scandinavian Underwater Technology (SUTEC), Linköping, Sweden, has recently acquired all rights to the Saab-Scania Underwater Technology Program. The agreement includes the purchase of the Saab-Sub (also called *Orca*) System, a heavy-duty, multi-purpose unmanned submersible equipped with manipulators and designed for operation down to 700 meters (see photograph). SUTEC plans to build a basic version of the Saab-Sub and furnish it to specific customer requirements.

Other equipment that SUTEC has available includes the *Sea Owl*, a small tethered submersible that can be used for observation purposes or to perform salvage jobs; a military version—the *Sea Owl-N*; an autonomous complete Mobile Operative Diving Station (MODS) which includes a *Sea Owl* system; UW-vehicle control systems which are designed to control any manned or unmanned UW-vehicle; hydraulic power systems for propulsion purposes and hydraulic manipulator and hydraulic tool operation; hydraulic pan-tilt tables to be mounted on submersibles; and hydraulic underwater tools which were developed for underwater use by divers or manipulators.

Pisces makes history

The 12-ton research submersible Pisces IV, based at the Pat Bay Institute of Ocean Sciences, completed its 1,000th dive Monday — only the second submersible to ever reach the 1,000 plateau.

The historic dive was made in a special ceremony and followed by a celebration and media tour.

Designed and built in 1972 by International Hydrodynamics of North Vancouver, Pisces is one of the few manned submersibles capable of deep-sea dives in the range of 2,000 metres.

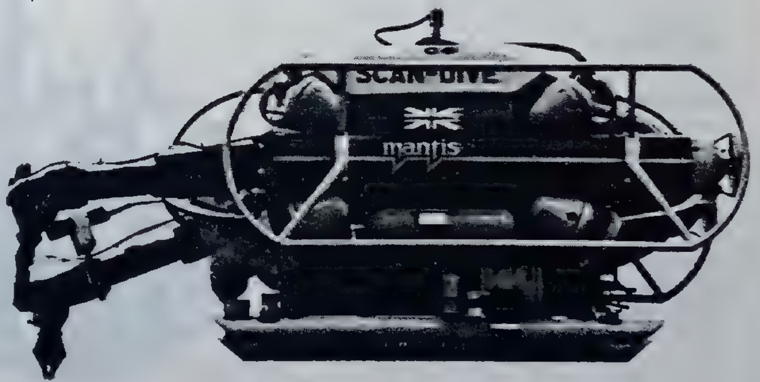
Submersible operations in the open sea — particularly launch and recovery from the mothercraft — call for a high degree of coordination between crews in the mothership and the submersible.

Dives are made from the mothership Pandora II — an ice-strengthened vessel designed specifically to support oceanographic and hydrographic programs in the Arctic, as well as off Pacific and Atlantic coasts.

Pisces' inshore work is carried out from the barge Pender, specially constructed to serve as living quarters for crew and scientists as well as a floating garage for the submersible.

Pisces is used by government and university scientists for a variety of oceanographic and hydrographic programs, including studying marine life in cliff communities of the inlets and fjords of B.C.; studying plankton population and distribution in Saanich Inlet; ocean turbulence studies; and investigation for proposed undersea cable routes.

Rig Support?
Think Submersible!

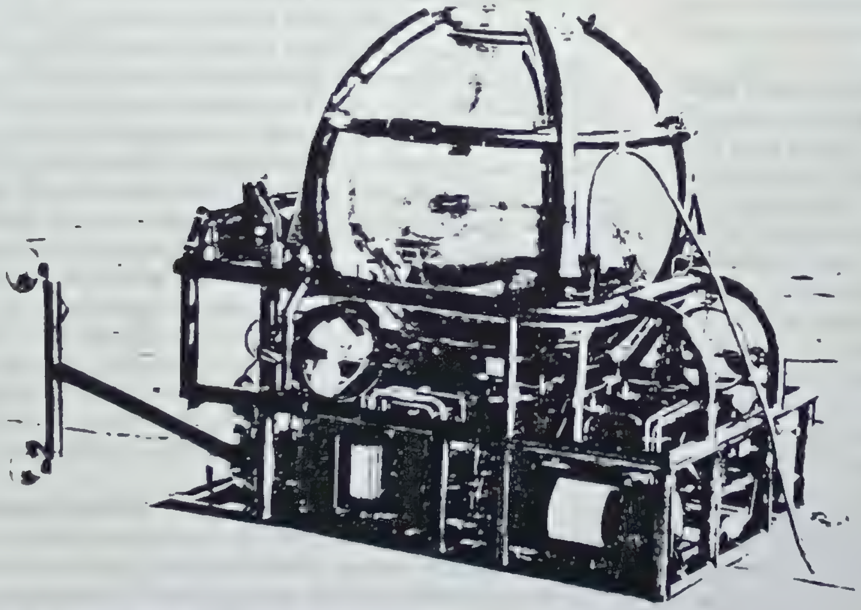


Mantis is now proven in rig support work, platform inspection and salvage operations. It is capable of working at depths to 610 metres and can be used for mid-water and bottom work.

OSEL GROUP

OSEL GROUP
Boundary Road
Harfrey's Industrial Estate
Great Yarmouth
Norfolk NR31 0LU
U.K.
Telephone:(0493) 59916/55509
Telex:975084

))) **Welling Gives Industry Side of Deep Ocean Mining.** Conrad G. "Connie" Welling is senior vice president of Ocean Minerals Company, a deep ocean mining consortium led by Lockheed Missiles & Space Co. (See cover of this magazine for Sept., 1980). Last month he gave the National Advisory Committee on Oceans and Atmosphere some of his ideas on law of the sea and other matters related to mining. Here are some of his points—Efforts by the United Nations Law of the Sea Conference (UNCLOS) on controlling deep ocean mining is the first time that anyone has tried to write rules for a nonexistent industry. If the present draft treaty is adopted there will be no ocean mining industry in this century. The present draft treaty does not include: assured access to resources; security of tenure; equitable settlement of claims; guarantee of three mine sites per operator, the number needed to be economical; and a grandfather clause giving prior rights to pioneers. Deep ocean exploration from only a few meters to 4-5,000 meters is a revolution, not evolution. The main problem with ocean mining is the difficulty of charting the topography of the ocean floor, making it hard to chose areas without large obstacles that are too big for the miner to go over or maneuver around.....Welling aimed at Ambassador Elliot L. Richardson, saying that the U.S. made too many concessions at the UNCLOS without getting provisions that are needed. He does not want the U.S. government to fund mining. Industry does not want government to tell it how to carry out a mining operation.



VERSATILE WORK/INSPECTION VEHICLE, Møllerodden's *Check-MATE,* can be equipped with manipulator.

IUC Buys One Man Submersible From Offshore Systems Engineering

Offshore Systems Engineering Ltd., Great Yarmouth, U.K. has sold the Mantis S/N 009, their deepest diving one-man submersible to IUC International, Inc. The submersible was scheduled to be available for lease this month.

Able to work to 700 meters, the Mantis is a second generation, one atmosphere tethered vehicle, equipped with eight thrusters. The vehicle carries a closed circuit TV system monitored by both the diver operator and the surface personnel, hard wire and emergency wireless communications, and two six-function manipulators.

The CHECKMATE is a 1.9m, one-atmosphere clear acrylic sphere designed to carry 2 people down to 300m. Kevin says it looks a great deal like the NEMO. (You will remember that we got many fine covers from the NEMO when it was operating out of the Naval Undersea Center in Port Hueneme, CA during 1970 to 1973.)

It has an operational time of 5 hours and an emergency back-up time of 120 hours. The unit has a displacement of 7,000 kg, a payload (with crew and manipulators) of up to 400 kg, and an overall length of 3.25m, a total height of 3.2m and a width over frame of 2.215m. Horizontal speed is 3 knots; vertical speed , 2 knots.

It is cable-fed (tethered) and is due to undergo final deepwater tests in March.

Mantis — a one-man micro-submersible

One of the more useful and acceptable alternatives to intervention and work underwater by divers is Mantis, a one-man micro-submersible designed and built by OSEL Ltd of Great Yarmouth. This sort of machine could be said to represent the level which has been reached by the industry to date in the effort to replace divers for certain types of work and, for that reason, is described here — and for the further reason that a significant breakthrough in this technology might be expected shortly, hopefully to be reported in this magazine in the near future.

THE EDITOR

General Description

The Mantis is a one-man tethered micro submersible. The pilot/diver breathes recycled air at one atmosphere. Electrical power for all services is normally drawn from the surface power unit via the tethering cable and the cable also provides hard-line speech communication and video channels to the surface. The tethering cable is armoured and is used in conjunction with a dedicated winch on the surface to directly launch and recover the vehicle. The normal operating attitude is with the pressure hull horizontal and the pilot lying on a contoured couch. The pilot has sufficient freedom of movement to be able to turn and lay on his back. The forward end of the submersible is an optically clear acrylic hemisphere, giving the pilot panoramic viewing. The vehicle and manipulator controls are carried on a projection of the couch to the acrylic hemisphere. Switches and controls needed only occasionally, together with the life support systems and instrumentations, are fitted into the overhead unit which runs the length of the hull above the pilot. The aft dome hinges open giving access. Two side points which can be jettisoned are fitted to the pressure hull. Each carries five thrusters, power transformers, electrical power control modules, manipulator power packs, manipulator mounts, buoyancy tank and compressed air systems. The emergency batteries, which can also be jettisoned, and skids, together with the trim weights, are fitted beneath the pressure hull.

Pressure Hull

The main component of the pressure hull is a simple filament-wound glass reinforced plastic cylinder with an approximate 650 mm internal diameter and a wall thickness of approximately 50 mm. At each end, aluminium LM25 TS casting plugs with 'O' ring seals are seated into the bore of the cylinder. The whole assembly consisting of the front acrylic hemisphere, the two aluminium end rings and the cast aluminium entry dome, are clamped together by an external framework of tie-bars.

Practical experience has taught OSEL that a poorly designed pressure hull will, on being subject to pressure, emit a noise which to the pilot can be deafening and even terrifying as components with different rates of contraction move against each other; hence the very careful "silent" design which enables all parts to float unrestrained and leave the pilot happily oblivious to the forces being restrained by the hull.

Main Electrical System

The power drawn from the cable is fed into two transformers (one in each pod). The input is normally 415 volts and the output from the transformers 30 volts rms. A 30 volt operational level for the submersible was chosen despite the high currents involved because of safety considerations to any divers who may from time to time work close to, or around the submersible. The 30 volt power rail is rectified in each pod and supplied to the thrusters, lights etc. by power relays housed externally to the pressure hull. A current limited 30 volt line is taken from each pod into the pressure hull for internal services for CO2 scrubber motors, control and for further refined power supplies to instrumentation etc.

In addition a current limited 24 volt line is brought from each of the emergency battery pods into the hull. Therefore in the hull there are four sources of power, each current limited and protected by a magnetic circuit breaker, any one of which will provide sufficient power for all normal operations.

Continued on page 23

Mantis, a one-man micro-submersible.

The complete Mantis system.

Thrusters

There are eight main thrusters, four fitted to the port side, four to the starboard side. These are angled so that combinations will provide full manoeuvring control in three dimensions. In addition two rear facing boost thrusters are fitted, primarily to provide an independent propulsion system for safety consideration. The control circuits are again duplicated, the primary pilots' control is either a joystick or a push-button control, (these are interchangeable and are used as the pilot prefers). A secondary emergency control station is provided — a dual circuit line — using independent connectors, power supplies etc. Therefore on the propulsion systems the vehicle has full redundancy on all functions, connectors, power and thrusters etc. This is because the vehicle is designed to *enter* structures such as platform jackets, where the normal safety mode of simply blowing tanks or dropping weights and surfacing under the forces of buoyancy is an option which is closed. Having entered the structure, the Mantis must, to ensure the safety of its pilot, be able to exit in a controlled manner on precisely the line it took to enter.

Life Support

The air pressure within the pressure hull is maintained within plus and minus four millibars at one atmosphere. Two electrically powered carbon dioxide scrubbers are fitted; each has a duration of approximately 40 hours and can if necessary be used manually with an oro-nasal mask. Two automatic oxygen make-up systems are fitted; each has a duration of approximately 40 hours. The high pressure oxygen is regulated down to approximately four bar and is then automatically bled into the atmosphere as required to maintain the reference pressure at approximately 1.05 bar.

The pilot has a partial pressure of oxygen readout together with a very sensitive gauge showing the cabin pressure changes. The submersible is also fitted with an independent pressure monitoring system which gives an audible warning to the pilot and to the surface of high or low pressure conditions. Both the oxygen systems have high pressure shut-off valves and the flow can be adjusted manually, if required, over-riding the automatic operation. Oxygen flow meters are also provided. The rear access dome is sprung loaded closed, but will crack open a limited amount to relieve high internal pressure (approximately 0.5 psi above ambient). The dome is used for pressure relief to prevent large forces building up on hinges and catches where a very quick response in relieving large volumes is necessary.

Buoyancy System

Two separate buoyancy systems are fitted, one to each side pod. Various modes of operation are possible, but essentially these systems are quite separate, although the physical arrangement of the vents allows the tanks to be fully flooded prior to launching. Each system has its own compressed air store, associated contents gauge and instrumentation and is operated by two mechanical breakthroughs in the forward aluminium hull ring, the first operating the air blow valve and the second the air vent valve. In normal operation, the air blow valves will be cross linked, allowing the one air store to blow both tanks simultaneously, keeping the other store in reserve.

Manipulators

Two manipulators are fitted to the front of the vehicle, they are hydraulic in the true sense of the word in that they are operated by *sea-water*. The energy source is an electrically driven sea-water pump. This unit together with its associated valves are housed in the respective pods, one for each manipulator. The manipulators are machined from a nylon chosen for its low intake of water and dimension stability, but also because its specific gravity is very close to that of sea-water. The result is very rugged manipulators which instead of being tucked in to prevent them being damaged are usually held out as fenders and used to shield the rest of the submersible. Yet despite their massive strength and resilience, they are close to being neutrally buoyant in water.

The Future

To date, ten Mantis vehicles have been built and more are under construction. The depth rating for manned operations, has been increased to 700 metres but looking ahead to the future, perhaps several years, OSEL is working on much deeper systems and a whole new generation of manipulators which it is hoped will vastly increase the work capability of these systems.

Development will continue until OSEL can say that its diving systems can, and will, replace a diver for all work tasks, at all depths of the ocean.

IUC International now has available for lease the new second generation MANTIS, single man, one atmosphere tethered vehicle, equipped with eight thrusters providing complete freedom of movement through 360 degrees in the horizontal plane and vertical movement. The vehicle, capable of working to 700m, carries a closed circuit TV system monitored by both the diver operator and the surface personnel, hard wire and emergency wireless communications and two six-function manipulators.

IUC has also set a record for carrying out daily diving support operations in the deepest depths, having recently completed its 43rd dive in the past 5½ months to depths of 4485ft from *Discoverer Seven Seas* in support of BNOC's drilling programme in the Rockall trough. Tasks carried out by *Pisces VI* during its latest series of dives included the changing out of the drillship's sonar positioning beacons, complete riser inspections, directing of drillstring re-entries and effecting repairs of BOP.

GOOD EVENING by Bill E. Burk

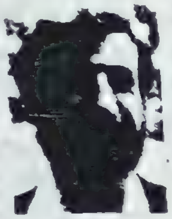
Yellow Submarine 'Unlocked' Nessie

THAT YELLOW submarine sitting in front of the Aquarium restaurant at 5538 Summer is more than just a one-time toy of its owner, Dan Scott Taylor Jr. No sir, not on your life. That home-built submarine has a chapter in its logbook that no other submarine on earth can match.

Taylor and his yellow submarine once spent six months below the murky and mysterious waters of Loch Ness in Scotland in search of Nessie, the legendary monster.

It wasn't built for that purpose. The search just sort of happened.

"I had always been interested in submarines," said Taylor, a former U.S. Navy submariner. "And I had been interested in the Loch Ness monster since I was in high school."



Taylor

During a stay in Atlanta, where he managed Justine's, Taylor built the submarine. It took him over four years to complete the turtle-shaped vessel. It stretched to 20 feet and weighed two tons.

"At the time I built it, I was thinking of using it in oceanographic research," said Taylor. "I had talked with Dr. Roy Mackal a couple of times. He is a molecular biologist for the University of Chicago and U.S. director of the Loch Ness Phenomena Investigation Bureau. At that time there had been a sighting (of Nessie). I asked him about the feasibility of using a sub in the search. He said that was fine, but they couldn't afford one. I told him I had one and if he would find a way to get me over there with it, I would donate my time and my sub."

A MERE FEW weeks later, Taylor was on his way to Loch Ness. His proposed search for Nessie by submarine even touched off a debate in the House of Lords, which wondered aloud if the mission was, in fact, in violation of the Cruelty to Animals Act of 1876. Convinced that Taylor's lone goal was to shoot a harmless dart into Nessie's hide and get a small sample, the lords gave him the green light.

"The first time into the water, I had no anxieties," said Taylor. "I was too tired. I had been up for three days trying to get the boat ready. All the rest of the time I was sort of anxious. It's kind of dark down there. Every now and then I would have thoughts that all of a sudden I would be staring Nessie right in the face."

COME NOW, DAN, you didn't really believe that Nessie was for real, did you?

"I'm convinced of it," he said, his face bearing the seriousness of his beliefs. "In fact, there are 20 such creatures down there at least, and maybe as many as 50, according to Dr. Mackal. I was drifting along one of the slopes one time and a large cloud of dust appeared just ahead. Suddenly, my sub turned around. And around. Two times. I thought at first I was caught up in my propwash, but then I realized it was heading the wrong way up the slope. Whatever it was was powerful enough to turn my sub around twice.

"My heart skipped a few beats that time. The only thing I could figure was that I had surprised Nessie. When she saw me, she turned and swam away."

On another occasion, Taylor was submerged at 100 feet when the sonar boat topside radioed to him it had a sonar contact with four creatures. The sonar boat gave him the changes of direction and told him to dive to between 300 and 400 feet. The creatures were clocked on sonar at 4.5 knots. As Taylor's yellow submarine closed in, they accelerated to 14 knots and got away. He had closed the gap to about 300 yards when they went off and left his sub, he said.

NESSIE, OR THE Nessies, he says, are of the eel family. They weigh about 35 tons, are carniverous, stretch to about 80 feet long, and are locked within Loch Ness — a body of water 24 miles long, one mile wide at its widest point, with depths to 1,000 feet — "unless she cares to pay five quid and pass through the locks."

Taylor was born into the restaurant business. His mother, Mrs. Dayton Smith, is proprietor of Justine's, long listed as one of the nation's Top 10 restaurants. The Aquarium, which features a live fish tank that Taylor built (it once housed sharks and eels in salt water), specializes in fresh seafood and steaks, oysters Rockefeller and rum cream pies.

And lots of Loch Ness lore.

The NOV/DEC issue of NOAA magazine tells about a new Undersea Research Network that is being formed by NOAA. Quoting: "Early in 1981 a nationwide network of underwater research facilities is going to get underway, working through universities, and offering a wide variety of equipment and laboratory services. Known as NOAA's Regional Undersea Research Program, the network will consist of the already operational HYDROLAB (NULS-1) that Fairleigh Dickinson University operates for NOAA, the Southeastern Undersea Research Facility (SURF) operated by a consortium headed by the University of North Carolina at Wilmington, the Western Regional Undersea Laboratory (WRUL) operated by the University of Southern California, and the Hawaiian Undersea Research Laboratory (HURL) of the University of Hawaii.

The University of Hawaii will use the submersible MAKALII (formerly the STAR II) with its associated Launch-Recovery-and-Transport (LRT) vehicle, and the habitat AEGIR. The University of Southern California will develop a new habitat system sited in an offshore kelp forest. The University of North Carolina is designing a highly mobile surface-supported dive system. The MAKALII will begin operations early in 1981. This is an Hawaiian term meaning "eye of the sea."

In 1981 the CYANA will have some tests in May and then for 30 days do another survey of the Britannic Canyons. The next 30 days will be for a new survey of the Gorringe Bank west of Portugal. Before the end of 1981 they MAY do an operation in the Pacific Ocean.

The EPAULARD, which is also under Mr. Caillart's authority, will work in deep Pacific waters from February to April on board the JEAN CHARCOT. They will have a port call in San Diego and will put into Manzanillo, Mex. at the end of the mission. M. Caillart's assistant, Henri Le Roux, is in charge of the EPAULARD. He is also a former CYANA pilot and we remember seeing his name on some of our covers. You may send covers for the EPAULARD up to Mar. 20 to...M. Le Roux - EPAULARD - N/O JEAN CHARCOT, % Shreve and Hays, Inc., P.O.Box 82237, San Diego, CA 92138.

1/81

))) **One Submersible Builder Remains Busy.** Despite economic difficulties in the submersible business, the British Columbia, Canada, firm of International Submarine Engineering is on a high sales plane. Orders have been received for 10 tethered, remote controlled units in the second quarter of 1980. Five are for the TREC and five for the DART ... The company has designed a vehicle that can be tethered or untethered, manned or unmanned, called the Wrangler. The torpedo-shaped vessel weighs 1,360 kg. When manned, the pilot lies prone.

Bland states, "ALVIN is in our shop torn down into about a thousand pieces for a complete inspection and "repair as necessary". Some modifications but basically overhaul and get ready for next diving season. LULU will go to the shipyard for a bottom job and some modifications and lots of repair work. Scheduled continuation of the 1981 diving schedule is the end of May with one trip from Woods Hole for local ops and then transit south. Diving along the east coast for USGS, then into Norfolk for a couple of days. Stop in Nassau and then Panama. Remainder of 1981 will be on the west coast with port stops at Punta Arenas, Manzanillo, and Mazatlan in between dive series.

ALVIN STATISTICS FOR 1980

Total dives 1980	92
Total depth	226,824m 744,172'
Total time	631.5 hrs
Average depth per dive	2465.5m 8088.9'
Average time per dive	6.86 hrs
Total passengers carried	174

TOTALS 1964 THROUGH 1980

Total dives	1085
Average depth per dive	1430.9m 4694.8'
Average time per dive	5.44hrs
Total passengers carried	1668

U.S. Lags In Ocean Research

DURHAM, N.C. (AP) — Insufficient funds, too little national interest and too much bureaucracy are causing the United States to lag behind in ocean research, the director of Duke Medical Center's hyperbaric laboratory says.

Dr. Peter Bennett said he believes it will take a national crisis before ocean resources are used fully.

Bennett's staff is using the center's hyperbaric chamber to test man's ability to endure great depths for long periods of time.

Bennett said producing energy from the ocean, and obtaining food, drugs and minerals, are the most promising benefits of ocean research.

He said research in energy conversion has been stepped up, especially since the price of oil has skyrocketed.

But other countries such as Japan have surpassed the United States in learning to harness energy from the ocean.

Ocean Thermal Energy Conversion is a solar technology that uses the thermal difference between surface and deeper layers of the ocean. That energy drives a turbine that converts solar heat collected at the surface into more usable energy.

With future technology, the technique could supply enough electricity from the Gulf of Mexico to supply power to the lower 48 states.

"We need a national crisis," he said. "Only when the present resources run out or prices become unaffordable will full utilization of resources become a reality."

Mr. Claude Caillart writes that he is now working for a new company, INTERSUB SERVICES, created in Jan. 1981 by the French companies Spie-Batignolles and Spie-Capag (Empain-Schneider group). Mr. Caillart was formerly with CYANA.

The registered office and operations base are located at the same address as the former company International Submarine Services, and the new team consists of some of the personnel previously employed by that company.

At this time they are operating the submersibles PC 1201, P5, and unmanned CETUS II.

Mr. Caillart has always been most cooperative about helping with covers, so I think you might be able to send him 2 with 1.80F French postage to...M. Claude Caillart; INTERSUB SERVICES; Groupe Empain Schneider; 99, Traverse Bovis; 13016 Marseille, FRANCE.

DIVING SAFETY. Divers are getting new protection from underwater dangers through a nationwide telephone hot line. The system, known as the Diving Accident Network, or DAN, was set up in early January by three federal agencies to provide doctors, rescue squads and others with expert medical advice on treating the most common diving emergencies. These are gas embolisms, or bubbles in the bloodstream, and decompression sickness, called the bends. DAN will operate from seven regional medical centers and will be staffed by specialists in underwater medicine. The Duke University Medical Center in Durham, N.C., will manage the network. Those phoning the hot line--(919) 684-8111--will get help in arranging transportation to the nearest facility.

NOAA Diving Manual Thoroughly Revised In New Edition

One of the most useful publications currently available is the NOAA Diving Manual, subtitled "Diving for Science and Technology." This is the second edition of the manual which broke all sales records for a book of its type in its first printing, 1975.

Editor Dr. James W. Miller and a group of 100 contributors managed to update virtually all the contents of the earlier manual, using the latest information available in a variety of aspects of diving included. Miller told ST that the only chapter that remained almost intact from the first edition was the first chapter, on diving physics. Otherwise, the book shows the evidence of a thorough effort to be current.

The manual's contents reflect the fact that its target audience is the community of NOAA divers. Of the 18 chapters, the longest ones pertain to equipment and scientic diving procedures. For the most part, the type of diving addressed is that conducted in waters of 75 m or shallower, with mixed gas. Readers interested in diving deeper, will find that not much space is devoted to helium diving. Such divers instead are referred to the Navy or commercial diving companies, who have had the experience and gained expertise in this area.

The chapter on saturation diving has been completely redone, integrating the latest information emerging how saturation diving experimentation over the last five years--relating results to the needs of the NOAA diver as well as of others diving in the same environment.

One chapter involving a surprising amount of work to update is the one on First Aid. Drastic changes have occured in recent times in the techniques of Cardio-Pulmonary Resuscitation and blocked airway situations, for example. Not just physicians but also paramedical personnel in the field were contacted for inputs into this chapter. Overall, the manual evinces a great deal of attention paid to the medical aspects of diving.

New topics receiving attention in this edition include the effects of smoking on divers and the effects of diving while pregnant. There is an entirely new chapter on accident management, in which the diver is provided with recommended steps surrounding a casualty ranging from anticipation of a problem to on-site treatment or air evacuation of the injured person(s).

All in all, the new NOAA Diving Manual, which measures more than one inch thick, is an extremely useful reference for all those engaged in diving in water depths of 75 meters or shallower. The almost universal appeal of the manual is clear by the fact that a number of recreational diver instruction organizations are buying it by the hundreds. It is for sale for $13.50 from the Superintendant of Documents, U.S. Government Printing Office, Washington, D.C. 20402.☐

Attention Owners, Operators and Crewmen Of Support Vessels Less Than 500 gt

CONGRESS recently enacted P.L. 96-378, the Small Vessel Inspection and Manning Act, which in certain circumstances relative to vessel inspection and personnel licensing, requires immediate action.

According to Robert J. Alario, president of Alario and Associates of Metairie, La., the industry's consultant in effecting passage of the legislation, the law is of major importance to owners, operators and crewmen of offshore supply, utility, crewboats, tugs and barges of less than 500 gt operating in support of exploitation of offshore mineral or energy resources. Alario stresses that the law, which is effective Oct. 6, dramatically changes or otherwise impacts present construction, operating and personnel practices in the offshore service industry.

As it relates to mineral and oil operations, the bill is divided into two major concepts. One deals with new inspection requirements for offshore supply vessels. (The bill does not impose inspection requirements on tugs, barges, crewboats, seismic or standby vessels engaged in oil exploration service.) Offshore supply vessels are defined as *any* vessel that is over 15 and under 500 gt which *regularly* carries goods, supplies or equipment in support of exploration, exploitation or production of offshore mineral or energy resources. The new law requires that every offshore supply vessel, either new or existing, must *now* be inspected.

Existing supply vessels are those units in service or contracted for on or before Jan. 1, 1979, and placed in service before Oct. 6, 1980. A highly simplified inspection procedure, consistent with safe practice, has been established to bring these vessels under certification. These vessels are *not* subject to rules, regulations or standards that would require major structural or equipment changes to the vessel, unless the Coast Guard (CG) determines the changes are necessary to remove an especially hazardous condition.

Vessel Registration. Owners of these vessels must register them with the CG *on or before* Jan. 6, 1981, to take advantage of the modified inspection program. Vessels not complying with these provisions will be considered to be operating illegally.

Licensing and Certifying of Seamen. The other major concept in the law, relating specifically to offshore operations, deals with the licensing and certification of the seamen manning these vessels, including licensing and certification requirements (licensed ocean operators and able seamen) aboard crewboats, tugs, barges and other vessels under 500 gt where CG manning/licensing requirements are applicable.

Temporary Ratings and Licenses. Several provisions in the law are designed to relieve the critical shortage of skilled, unlicensed (ordinary and able seamen) and limited licensed seamen primarily through changing sea time and examination requirements. Toward that purpose, the CG is authorized to receive *Applications for Temporary Ratings* or licenses from any person who has served aboard a supply or utility vessel, in any capacity, on or before Jan. 1, 1979. Applications must be sent to the CG before Jan. 6, 1981, and will be valid for no more than three years. This provision was enacted to permit the retention and upgrading of those individuals who are presently not licensed or certified, but who possess significant, competent experience and skills in the operation of offshore supply vessels.

Rules and Regulations for the Construction and Classification of Submersibles and Diving Systems. Lloyd's Register of Shipping, Crawley, W. Sussex, UK Loose leaf format £20.

The Rules, says Lloyd's, have been 'completely revised' and a loose leaf format has been adopted 'as the field of underwater engineering is rapidly developing.'

They incorporate not only the regulations and requirements for the design and construction of submersibles and diving systems, but also guidance notes and recommendations on both design and operation.

Topics cover pressure and temperatures ranges, breathing gas, as cylinder colour codes, fitness to dive, spare gear and consumables, transport and storage, acrylic windows, umbilicals for tethered submersibles, protection of personnel under pressure in surface compression chambers, and controls and instrumentation.

A purchaser has at long last been found for the InterSub fleet of submersible mother ships, which have been in lay-up since May, when the company ceased trading. **British Underwater Engineering** has signed a sales agreement **to purchase the InterSub assets** held by First Dallas Ltd, which amounts to all the ships and eight of the submarines. A deposit has been paid and the deal is expected to be completed in the next couple of weeks. The remaining submarines are held there by Trans Union and two by Northern Offshore.

Watch Receiver IMCO Requirements

IMCO Resolution A.383 mandates that seagoing vessels must be equipped with a watch receiver tuned to the 2182 kHz voice distress frequency, which must be monitored 24 hours a day while the vessel is at sea.

Oilman, Inventor Racing To Reach The Titanic First

Cox News Service

CORAL GABLES, Fla. — After 69 years with hardly a clue as to the whereabouts of the Titanic, two adventurers suddenly are racing the clock — and one another — to see who'll find the sunken liner first this summer.

The two could hardly be more different. One is a wealthy Texas oilman who enjoys the sport of the hunt; the other is an inventor who had to sell his electronics shop to finance his expedition.

For the inventor, the mission to explore the Titanic is the fulfillment of a lifelong dream. He has worked 13 years designing a deep-sea submarine for the voyage to the bottom of the sea. He sold his business to raise money for the craft, which he believes will help him "get there first and get the diamonds."

For the oilman, the expedition is the latest in a series of adventurous scientific missions he has bankrolled and shared in. He thinks he has seen the Titanic before — on a sonar screen near the end of a $1 million search in the North Atlantic he financed last summer for the ship.

On this summer's trip, he wants to photograph the Titanic, "and, incidentally, pick up the little jewels."

The "little jewels" are a cache of gems which were worth about $17 million in 1912 when they were locked in a safe inside the purser's cabin on the Titanic. The jewels and 1,490 people went down when the "unsinkable" liner hit an iceberg April 12, 1912, on the fifth night of its maiden voyage.

Electronics wizard Fred Koehler of Coral Gables plans to hold those jewels in his hands by the end of the summer. To do it, he'll have to beat out Texas wildcatter Jack Grimm and a crew of scientists in a race that could run two miles below the surface.

"I'm going to beat out Jack Grimm," Koehler boasted this week. "His equipment is obsolete. I'm going to get to the Titanic first, and I'm going to bring back the diamonds."

"I'm glad he's going to give it a shot," Grimm said from his Abilene, Tex., office. "That'll make it all the more fun, won't it?"

Grimm apparently isn't worried that Koehler might beat him to the payoff. "I think the chances of anybody doing that are very slim," he said. "But let him try. It's in international waters. It's anybody's ocean. I don't envision a sea battle over it."

Koehler sold his electronics repair shop two months ago to raise the money he needs to build an "underwater helicopter" — a two-man sub he has worked on for the past 13 years.

The "seacopter" looks like a giant mosquito, with a mechanical arm in its nose like the probes used to take rock samples on the moon, a rotor in its tail similar to that in a helicopter, and tank-like treads for rolling along the sea floor.

Koehler claims the seacopter can take two men to a depth of 15,000 feet — deeper than any man has gone in a vessel that isn't attached to a ship at the surface, he said.

Koehler plans to take his 14½- by 7-foot craft inside the hull of the Titanic, maneuvering through the ship's corridors to the purser's cabin. There and in other areas he expects to find a treasure trove that he estimates is worth more than a half-billion dollars today.

"I wish him luck," said Grimm. "That's a good way to get planted in there with 1,500 other people, I think."

Grimm sponsored a monthlong, $1 million expedition in search of the Titanic. His crew used sophisticated sonar equipment to map a 30-square-mile section of the North Atlantic near the spot where the ocean liner sent its last distress call. In one 10-square-mile patch of ocean, the sonar equipment mapped 14 objects that could be the Titanic's 882½-foot steel hull.

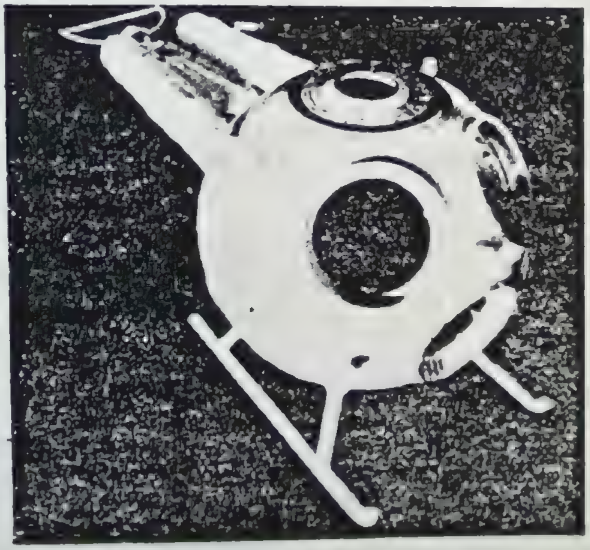
Bad weather forced the expedition back to Boston two days after scientists saw two promising outlines. Grimm believes one of them is the Titanic.

A Texas A&M research ship carrying Grimm, expedition leader Mike Harris and scientists from the Scripps Institution of Oceanography and the Lamont-Doherty Geographic Observatory will return to the sites this summer. They plan to send an unmanned submarine to explore and photograph the sites.

But Koehler plans to be there first. When he and Grimm couldn't reach a deal on the use of his seacopter for this summer's expedition, he decided to go ahead on his own.

Said Grimm: "He's got a lot of problems to solve first. He's got to find it first. He doesn't have my coordinates. Nobody has those."

"I have my own sources," retorted Koehler. "I know where it is."



CORRECTIONS TO DSPA MAILING LIST----APRIL, 1981

PARKER, James R.
(DEEP QUEST)
(Associate Member)

RES: 1016 Alveda, El Cajon, CA 92021
(714) 447- 7924
BUS: Lockheed Ocean Laboratory
3380 N. Harbor Drive
San Diego, CA 92101
(714) 298-8630

DRYFKA, John E. (LCdr, USN)
(DSRV AVALON)

RES: 11428 Via Promesa
San Diego, CA 92124
(714) 292-7707
BUS: O-in-C, DSRV AVALON
NAS, North Island
San Diego, CA 92135
(714) 437-7767

GAZDIK, Thomas M.
(PISCES VI)

RES: 25304 146th Ave. S.E.
Kent, WA 98031
(206) 631-3391
BUS: IUC, 222 Fordham St.
City Island, NYC, NY 10464
(212) 885-0600

JOHNSON, Philip E. (Capt, USN)
(ex-DEEP JEEP)

RES:
BUS: COMNAVAIRLANT
NAS, Norfolk, VA 23511
(   )

LEONARD, William J.
(ex-TRIESTE II)

RES: 4935 Dorena Court
San Diego, CA 92122
(714) 452-1385
BUS: Path Research
4250 Pacific Highway, Suite 205
San Diego, CA92110
(714)225-0005)

SLATER, Richard A., PhD
(ex-NEKTON's)

RES:
BUS: McLelland Engineering
5450 Ralston St., Ventura,CA 93003
(   )

TRAPHAGEN, Peter G.
(NEKTON's)

RES: 822 Capistrano Place
San Diego, CA 92109
(714) 488-3093
BUS: NEKTON,Inc.
11578 Sorrento Valliy Road #25
San Diego, CA 92121
(714)452-9540

WILLS, Melvin B., Jr.
(DEEP QUEST)
(Associate Member)

RES: 1631 Strand Way, Coronado,CA92118
(714) 435-0474
BUS: R/V TRANSQUEST, Lockheed Ocean Lab
3380 N. Harbor Dr., San Diego,
(714) 298-8453 CA 92101

DEEP SUBMERSIBLE PILOTS ASSOCIATION

NEWSLETTER

AUGUST,1981

Vol. XV, No. 3, Published by the Deep Submersible Pilots Ass'n

The Deep Submersible Pilots Association was formed in 1967 to provide for a free interchange of information relative to deep submersible design, operations, techniques, and materials in order to further the safe and peaceful progress of man into the deep oceans.

Requests for information or contributions to this NEWSLETTER may be addressed to:

Robert K. R. Worthington
Editor &Secretary, DSPA
3005 Curie Street
San Diego, CA 92122
(714) 453-1158

or

Donald E. Saner
President, DSPA
4707 Berwick Drive
San Diego, CA 92117
(714) 278-4613

Correspondence regarding new member applications should be addressed to:

Willis Forman
Membership Chairman & Vice President
1527 Linwood Street, Apt. 5
San Diego, CA 92103
(714) 295-0620

EDITORIAL NOTES AND COMMENTS

Member Don Walsh was interviewed for the Los Angeles Times, 7/19/81 issue. The excerpted biographical sketch included in this Newsletter came from my daughter in L.A., not from Don. He and the other member of the "Daring Dons", Keach, made what must have been a fascinating five-week visit to Japan, Russia, and England. Keach's minimal report of the trip in a letter to Don Saner was just enough to tantalize. Can you find time to amplify, Don, any Don?! Your photographs are great, but captions would help-Where? Who? When? What? We can guess the "what"!

Scuttlebutt is that Jack Bennett celebrated in San Diego for a week when PICCARD finally sailed from San Diego for the Canal on 15 April under tow by their tug CLIFFTON. Happily, we can report that they did arrive safely at Mobile after their transit so that Jack could have another celebration.

Our Canadian Members were kept in limbo by the postal strike. I wonder where all that mail was stacked for two months.

SECRETARY'S REPORTS AND NOTICES

As of the last accounting, the following Members are still in arrears: Bradley,($5 only), Chambers, Roberts, Plancon, McClay. After 1 Sept., unless forgiven by the Board for cause, a $10 penalty is added to dues for reinstatement. Canadian Members will be given a one month extension because of the postal strike. Advise if you have similar good justification for late submission.

DSPA insignia items are available as follows:

Pins	$2.00	
Decals	$1.00	(inside or outside)
Patches	$2.00	(3" diameter, embroidered)
T-shirts	$6.00	(insignia fore or aft) (size: S, M. L. XL) (color: white, yellow, light blue)

Order from Forman or Worthington.

DSPA San Diego Luncheons were held at Tarentino's as follows:

4/16/81

Members Present	Non-Members Present
Bob Worthington	Dave McCafferty-Searle Consultants
Don Saner	Steve Kernaghan-
Al Smith	Lt. Pat Baccei -DSRV MYSTIC
Ron Rau	Bob Martin - " "
Jim Helle	W. T. Orrison - " "
John Schiltz	
Chris Landrum	
Bill Leonard	
Dick Hall	
Jack Bennett	
Doug Privitt	
Will Forman	
Joe Thompson	

Bob Worthington announced that Jack Bennett was providing the wine in celebration of AUGUSTE PICCARD's departure for the Canal enroute Mobile yesterday and welcomed long-time Member Jim Helle and another old-time ex-Member Joe Thompson.

Jim Helle reported his observations of the extent of U/W activities at sites visited during his recent tour of Hawaii, Japan, Taiwan, Australia, Singapore, Dubai, Egypt, and Scotland (and Heaven knows where in between!).

Joe Thompson commented on his fascinating operations in the business of making underwater and other documentary films over the past ten years, including the award-winning film of the Gossamer Albatross Crossing of the English Chammel.

Bob Martin eulogized his mentors in the Navy with especial plaudits to Dave McCafferty, Stretch Leonard, Al Smith, and others among those present.

Jack Bennett remarked humorously on the problems of getting PICCARD underway for the Gulf Coast ever since her arrival at San Diego in October of 1978 for a "short" visit. (N.B. : Reference to the Nov. '79 Newsletter shows a planned departure date in February of "79.

cheons-continued

5/21/81

Members Present
Don Saner
Bob Worthington
John Schiltz
Will Forman
Jerry Shiller
Tom Vetter
Pete Traphagen
Bill Leonard
John Cameron
Al Smith
Ron Rau

Non-Members Present
Dave McCafferty-Searle Consultants
Steve Kernaghan
Keith Nichols-Capt., USN (Ret.)

Bob Worthington introduced Keith Nichols, his USS SILVERSIDES buddy of WW II; reported news and correspondence from Members; and recommended interest in membership in the local branch of the Marine Technology Society.

Jerry Shiller reported that the Nekton support vessel SEAHAVEN is enroute to San Diego from the Gulf Coast. SEAMARK is under overhaul and modification in San Diego and will depart for Alaskan waters in June.

John Schiltz reported he is quitting SEACO to work for Honeywell Marine Systems in San Diego.

6/18/81

Members Present
Don Saner
Bob Worthington
Will Forman
Ron Rau
Chris Landrum
Dick Hall
Al Smith
Jack Bennett
JohnJohn Schiltz

Non-Members Present
Lt. Pat Baccei-DSRV MYSTIC
Rich Luke- " "
Al May- Capt., USN (Ret)

Bob Worthington read a letter from Don Keach re possibility of accepting USSR deep submersible pilots as Members. Consensus was to recommend that they join I.U.P.A., our "European Branch".

Don Saner reported DEEP QUEST is being reactivated for tests of a fiber optic TV system and other projects. She is still "wearing make-up for her role in the movie "Sink The Titanic". It appears the movie didn't make enough money to pay for repainting. Don passed around Keach's excellent color photos of the Japanese SHINKAI 2000 and the USSR ARGOS (PISCES).

Will Forman reported that a reorder of DSPA T-shirts has been received.

Jack Bennett reported that PICCARD arrived safely at Mobile. Only the tug/support ship is in bad shape.

Luncheons-continued

7/16/81

Members Present	Non-Members Present
Don Saner	Bill Bradley-NEKTON
Bob Worthington	Randy Charlton- "
Ron Rau	Tim Caffarello- "
Tom Vetter	
Al Smith	
Bill Leonard	

Bob Worthington noted that parking in the area is jammed due sport fishermen here for the albacore run. News from Members was nonexistent this month except for the IUPA Newsletter from Al Whitfield and, of course, the "½ Fathom" from Irene Fager.

Tom Vetter reported that NEKTON's SEAHAVEN is 1000miles south, headed for her initial visit to San Diego, that Jerry Shiller is on a geophysical survey in Cook Inlet, that Merle Wilson is working off Santa Barbara in SEAMARK, and that the NEKTONs will be diving in Santa Barbara Channel next month.

Bill Leonard reported on interesting developments at OTC, including an interesting brushless motor for submersibles.

Ron Rau stated he had sent notices to Members in arrears. A cross-check with the Secretary's records indicated that two of them had already paid: Saxon and Shumaker.

LETTERS FROM MEMBERS

Irene Fager-One Half Fathom
"The writer of the article about PISCES IV in the April DSPA Newsletter did not do his research very well. By my count, five submersibles have now passed the 1000 dive mark. ALVIN made dive #1000 on 1/15/80. PISCES II made dive #1652 on 9/3/80. PISCES III made dive #1648 on 1/12/81. Johnson SEA LINK I made dive #1000 on 2/21/81. PISCES IV made dive #1000 on 3/9/81. I don't know the exact dates for PISCES II and III for their #1000 dives, but they have both gone over that mark."

Kevin Parker-HMB Subwork
"Steve Davies and I have left Oceaneering and have joined H.M.B. in the capacities of Operation Controllers. Steve is working from the Discoverer 534 in 1500' about 140 miles west of Shetland. I have just come from that rig and am about to go somewhere else , but I don't know where just yet. I have enclosed some more information on the MANTIS for you."

Mike Macdonald-I.S.E. Gulf (4/29/81)
"The fiberglass pressure hull for our one-man and/or remotely controlled "WRANGLER" has arrived in Vancouver. Sea trials should be this summer. We are now up to DART #11. The sub-sea deployment cage has proven very successful. Two new hydraulic vehicles, one TREC size and one TROV size,are in the works. At O.T.C. this year we will be displaying our first computer controlled manipulator. I hope you all get a chance to see it."

May 11, 1981

The 1981 Houston
Offshore Technology Conference
OTC

by

Larry Megow

The May 4-7, 1981 OTC is now history. But what a historical event it was - undoubtedly the world's largest convention ever.

The 1981 statistics compared to the 1980 figures are staggering:

	1980	1981	
Attendance	86,965	100,329	up 16%
Revenue into Houston economy	$37,200.00	$50,000.00	up 34%
Number of exhibitors	2,200	2,300	up 9%
Exhibit area	483,000 sq.ft	519,000 sq.ft	up 8%

More than 200 papers were presented during the 42 technical sessions on all facets of offshore activities.

Before the Conference was concluded, the OTC management announced that the OTC would continue to be held in Houston until the year 2,000. However, there will be some changes. The OTC will continue on an annual basis through 1984, but will then switch from an annual exposition to bi-annual. This means that there will be no equipment exhibitions in 1985 and 1987. However, it is anticipated that technical sessions will continue to be held annually.

It is also planned that in 1984 the Conference will be extended from four to six days.

This year many attendees had to find housing as far away as Galveston and Conroe, but by 1983 Convention housing authorities announced that available hotel rooms will be up to 34,000 from the present 26,000.

Yes, the 1981 OTC was highly successful, informative, interesting and profitable to all who participated - the exhibitors, the attendees, Astrodomain, and the City of Houston.

Plan now to attend the 1982 OTC.

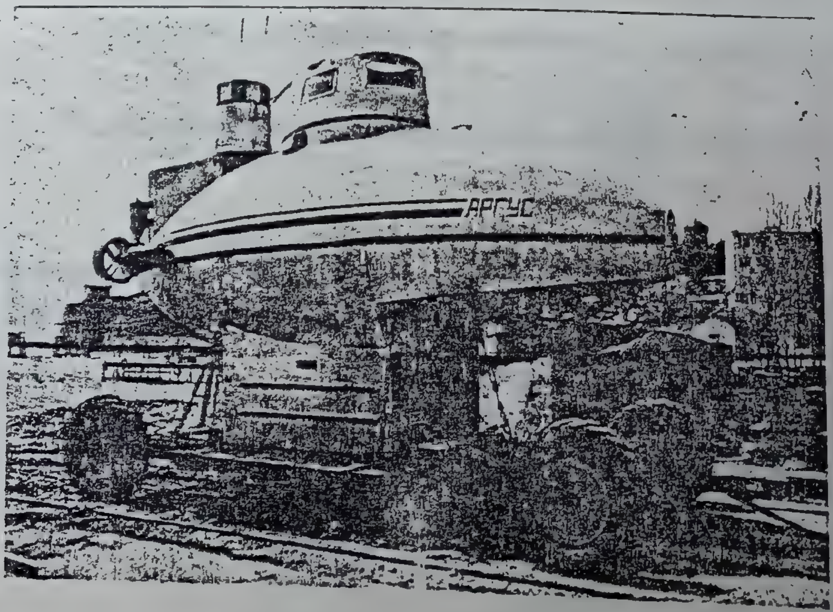
Craig Deweese-ex-NEKTON (4/26/81)
"As you may know, I am no longer in the employ of Doug Privitt. Therefore, I don't have an avenue of communications through him concerning DSPA activities, so please send the Newsletters to my home address. I wouldalso like to attend the luncheons once in a while if you would send me a notice. I have returned to a former position with K-Jack Eng. Co. in Gardena where I am happier, healthier, and wiser. Unfortunately, this company has nothing at all to do with submersibles, but you have to do what you have to do to survive. Right?"

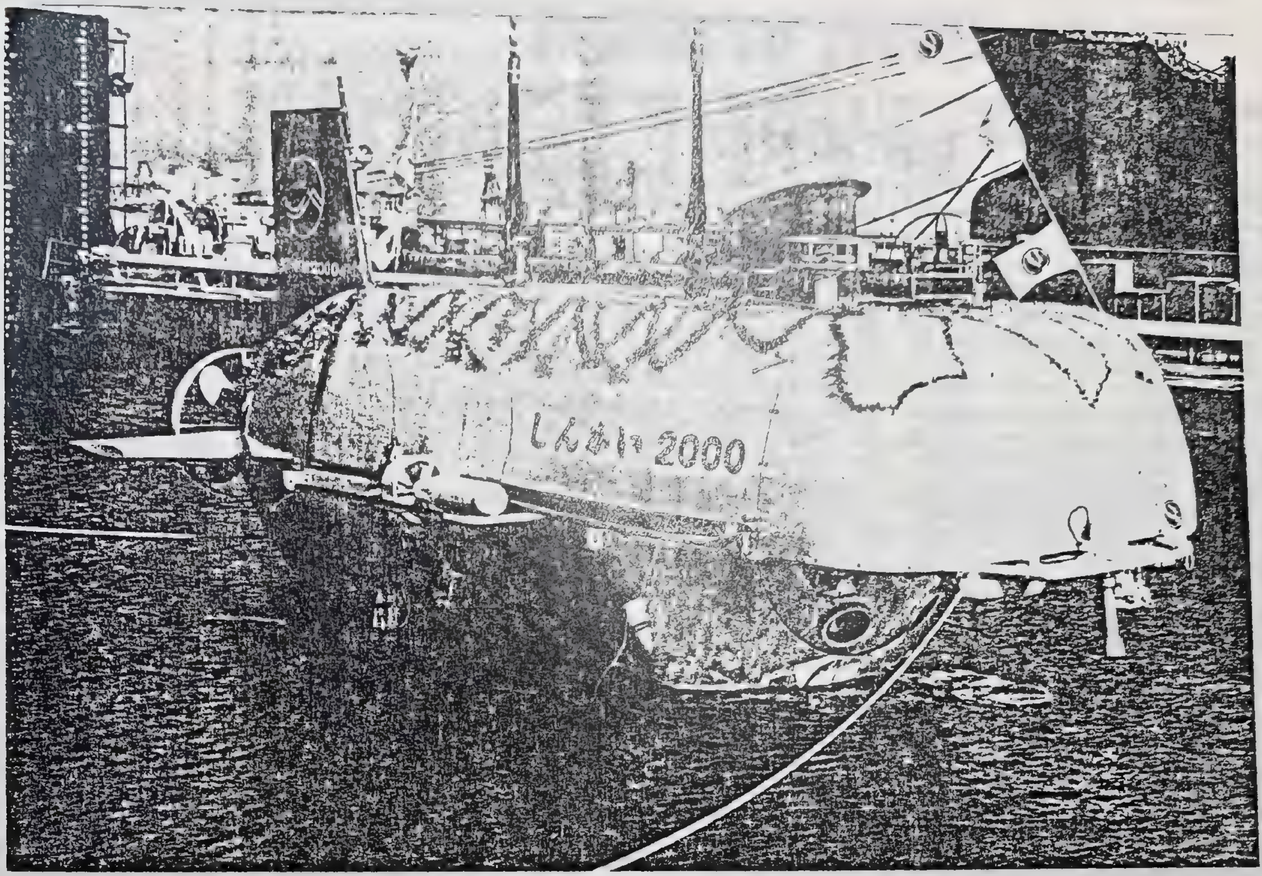
Mike Staehle-NOAA (5/1/81)
"Nothing newsworthy to report. I'll give the Newsletter an update on what's going on in NOAA Ocean Engineering later in the fall."

Alan Whitfield-HMB Subwork (5/30/81)
"The new submarine school is getting off to a great start, with nice publicity from the TV and press. I'll keep you ingormed during th summeras to how the students progress. On Tuesday I am off to join MANTIS 004 for a couple of weeks--deep drilling support (N. Sea). I.U.P.A. Newsletter on route."

Jim Beachler-USS BONEFISH (6/2/81)
"Bonefish is scheduled to return to San Diego during the month of July. Hopefully, we will remain in for a while and I will be able to attend some of the DSPA meetings. After seven months in WestPac, I'm ready for a few months in San Diego. Looking forward at a active part of the membership after a six year absence from San Diego."

Don Keach-USC Institute for Marine and Coastal Studies (5/22/81)
"Don Walsh and I have just returned from a five week visit to Japan, England, and Russia. Aa you can see from the enclosed photos, the Japanese and Russians are both operating submersibles. The Russians have nearly 400 dives in their two PISCES boats and over 100 in the ARGOS (a 600-meter craft). They have seven pilots qualified to join the DSPA and have asked for details about DSPA which they can show to their maximum leader in order to get permission to sign up. Do you have a copy of the chafter? I am currently having several articles concerning their dives in Lake Baikal and the Red Sea translated into English. If they are of interest, I will send copies for possible inclusion in the Newsletter."

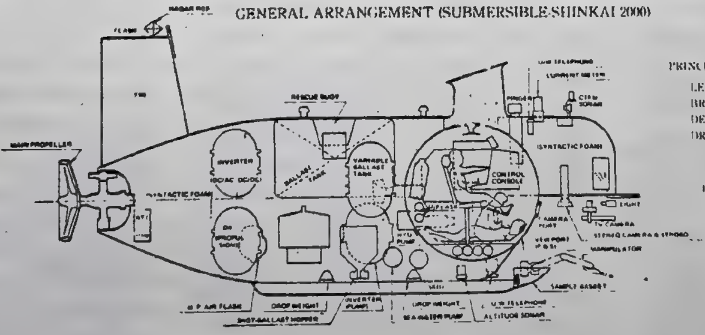




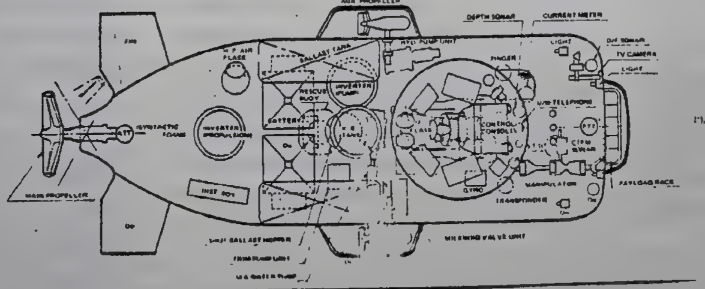
GENERAL ARRANGEMENT (SUBMERSIBLE SHINKAI 2000)

PRINCIPAL PARTICULAR

LENGTH (O.A.)	ab. 9.3 m
BREADTH (MLD)	3.0 m
DEPTH (MLD)	2.9 m
DRY WEIGHT	ab. 25 t


RADAR REF.
FLASH
FIN
MAIN PROPELLER
RESCUE BUOY
INVERTER (DC/AC DC/DC)
BALLAST TANK
VARIABLE BALLAST TANK
CONTROL CONSOLE
SYNTACTIC FOAM
PINGER
CURRENT METER
CTFM SONAR
LIGHT
CAMERA POINT
TV CAMERA
STEREO CAMERA & STROBO
VIEW PORT
MANIPULATOR
HYD PUMP
SAMPLE BASKET
H.P. AIR FLASK
DROP WEIGHT
INVERTER (PUMP)
SHOT-BALLAST HOPPER
DROP WEIGHT
SEA WATER PUMP
U.W. TELEPHONE
ALTITUDE SONAR

PROFILE


AUX PROPELLER
DEPTH SONAR
CURRENT METER
FIN
H.P. AIR FLASK
BALLAST TANK
HYD PUMP UNIT
LIGHT
D/H SONAR
TV CAMERA
LIGHT
PINGER
RESCUE BUOY
INVERTER (PUMP)
U/W TELEPHONE
SYNTACTIC FOAM
INVERTER (PROPULSION)
BATTERY
CONTROL CONSOLES
CTFM SONAR
MAIN PROPELLER
INST BOX
MANIPULATOR
PAYLOAD RACK
GYRO
TRANSPONDER
SHOT BALLAST HOPPER
TRIM PUMP UNIT
SEA WATER PUMP
VALVE UNIT

PLAN

don walsh

with curiosity, optimism and a pragmatic approach, he guides exploration of our ocean resources

Even now that he has a civilian job, Don Walsh doesn't stay put. As director of the University of Southern California's Institute for Marine and Coastal Studies, he's traveling almost as much as he did during his 25 years in the Navy. Joan Walsh, the daughter of a career Coast Guard officer, doesn't seem to mind, though. "Between living with my family and with Don, I've now moved 41 times," she says. "But I love to travel and usually go with Don on his business trips around the world."

Whether he's lecturing or attending an international marine conference, those trips are bound to be full, as are the days at home. Don works 10 to 12 hours a day, and has written more than 75 articles and contributed to and edited three books. Five years after taking over at the Institute, he had initiated many significant projects, and expanded research, education and service programs on the USC campus, Catalina Island, Terminal Island and the port of Wilmington. Activities there now include studies on the effects of industrial waste on marine life, the ocean as a source of food, the use of marine life for medical research and formulating maritime law.

Don grew up in the San Francisco Bay area. His parents divorced when he was 3 years old, and as an only child with a working mother, he soon learned to be independent. At the age of 8 he decided to become a test pilot; and while still in high school joined the U.S. Naval Air Reserve.

"But I never understood the relationship between performing well in school and having access to the things you wanted in life," he says. "I had planned to go to UC Berkeley, major in aeronautical engineering and then get into military aviation, but I didn't have the grades."

Deciding to try for the Naval Academy at Annapolis, he went to a school specializing in exam preparation, and meanwhile hedged his bet by also applying to West Point and the Coast Guard Academy. Accepted both by West Point and Annapolis, he chose the Navy. A vision problem eliminated aviation as a career field, but he did serve in the submarine force. He eventually had command of a fleet and was introduced to marine science through his work as officer in charge of the bathyscaph Trieste, a deep-sea research vessel.

Don's energy and drive also earned him a master's degree in political science and a master's and doctorate in oceanography. His final year in the Navy was spent as a fellow at the prestigious Woodrow Wilson International Center for Scholars in Washington, D.C.

In 1975 he was appointed director of the Institute for Marine and Coastal Studies. "I was brought out for an interview, but when I asked the committee of faculty and administrators what they wanted done, they said they hadn't quite formulated a program. I said perhaps they were wasting my time and theirs because it seemed to me that you have to know your needs before you hire someone to fill them," he says. "I went back home and told Joan we could forget about the job because I was probably more blunt than I should have been, and I swear the phone rang right then. The university president was calling to tell me I had been hired." So the Walshes moved again. Now they live overlooking the Pacific with son, Kelly, 13, and daughter, Elizabeth, 9.

Q. What is the most important work the institute is doing?

Don. That's a tough one. We have about 100 projects going on at a time, and we try not to duplicate the work being done at the other marine institutes, Scripps and the University of California, because it's a waste of taxpayers' money. Our harbor environmental study has been operating for nearly a decade, both in Los Angeles and Long Beach. For example, there may be a proposed construction contract in the harbor area evaluated at $3 million worth of work and we're given the environmental impact study to review for thoroughness.

We also did some work on the discharges from the tuna canneries. The Environmental Protection Agency threatened to shut down the canneries unless they built a sewage treatment plant. The canneries said they would close rather than do that, which meant a few thousand minority workers would be out of jobs. We were able to demonstrate that the cannery waste was not damaging to the harbor fish, that in fact it was beneficial because the material is very rich in food values as long as you keep the discharge controlled and balanced with a supply of oxygen. If the cannery operates in surges, for example, they may have to store a lot of the waste in a tank and let it out during the night at a fixed rate. The fish then line up and lunch on this very nutritious soup.

When the tanker *Sansenina* blew up in L.A. Harbor a couple of years ago, we were there the next day with our ship and divers to evaluate the environmental impact. They had just unloaded their crude oil, but they had also refueled. Fuel oil for a steamship is like sludge, just a little bit better than asphalt, and it sank right to the bottom and lay there, smothering the organisms on the sea floor.

One of our most exciting programs is called the Marine and Fresh Water Biomedical Research Center, and it is implemented under a grant from the National Institute of Environmental Health. The center is looking at poisons and other harmful substances concentrated in the marine environment that are ingested by man, such as the mercury found in swordfish. And we're also looking for marine organisms that may make good laboratory test animals. We're also trying to develop pharmaceuticals from marine organisms. It's been found that they have a 10 times greater probability of anti-viral, antifungal and anti-tumor properties than land organisms.

Editorial

Larry L. Booda

A Research Dilemma

A proposed joint U.S.-U.S.S.R. scientific expedition to a mid-ocean ridge in 1982 could exert a profound influence on the security of U.S. and NATO military installations and oil and gas activities of the Northwest Atlantic and the North Sea. Here is the background of what is happening.

Oceanographers of the United States have participated in many bilateral and multinational efforts in marine science in the recent past, especially since 1960. Those joint expeditions have contributed vast amounts of data that have improved man's knowledge of the oceans. An outstanding example was the International Decade of Ocean Exploration which covered the 1970s and included one air-sea-space effort concentrated in the southern hemisphere.

These endeavors of the past have been carefully orchestrated to avoid revelation of data inimical to the security of the western bloc of nations. Some of those data were obtained by technology that is the exclusive property of the U.S.

Thus the factor of national security must be considered. Oceanography is not only a province of the civil side of governments; it is a vital element of the military effort, particularly the undersea warfare (USW) and antisubmarine warfare (ASW) efforts. Now another proposed joint U.S.-U.S.S.R. oceanographic project must be examined with these points in mind.

Sea Technology has learned that Dr. A. Monin, director of the P.P. Shirshov Institute of Oceanology in Moscow, has suggested that the two countries cooperate in a joint expedition in the summer of 1982 to explore the Reykjanes Ridge that extends 600 nautical miles southwest from Reykjavik, the capital of Iceland. This ridge is a relatively high portion of the Mid-Atlantic Ridge where the earth's magma oozes out and the sea floor spreads away from the rift zone.

What Monin wants to do is mount a multidisciplinary probe of the ridge centered around the use of the submersible *Alvin* operated by the Woods Hole Oceanographic Institution, but owned by the U.S. Navy, and the *Pisces XI* of the Shirshov Institute. The expedition could also include other national participants. In the proposal Monin cites the use of submersibles in other rift zone projects such as the Mid-Atlantic Ridge, the East Pacific Rise and a U.S.S.R. exploration of an incipient rift zone in the Red Sea. More rift exploration is needed to better understand tectonic plate movement, he stated.

As for the Reykjanes Ridge, it is noted that it differs from other oceanic spreading ridges. It is between 1,000 and 2,000 meters below sea level compared with the usual ridge depths of 2,500 to 2,700 m. to the south. To the northeast it becomes the above-sea-level island of Iceland. It has the very slow spreading rate of 1 cm/yr and lacks a rift valley. No transform faults have been found along the ridge.

The proposal goes on to detail the possibilities for research and the areas to be covered. There would be detailed bathymetric, magnetic, gravimetric and seismic—including deep seismic—surveys. About 60 dives would be made by the submersibles during the 60 day period on the sites. Some additional time would be involved in preparation for the expedition and proceeding to and from the area.

The above is a brief description of what the Russians propose. What lies below the surface of the proposal is that the geographic area mentioned is a very sensitive one for NATO, USW and ASW. All Soviet ships and submarines exiting from and approaching the Murmansk area must traverse either side of Iceland. Detection and surveillance of these corridors have been the keystone of ASW for years. Russia at one time tried to surmount this advantage of the U.S. and its allies by supporting a friendly government in Iceland. That failed because the U.S. upped its financial ante in the diplomatic game.

Now an initiative is being mounted in the direction of scientific endeavor. There is no doubt that the Russian oceanographers are sincere, dedicated men. But the area they have chosen is a vital one from the Soviet military standpoint. That poses a dilemma. Past experience shows that the Russians will bend every effort to gain a military advantage. Who would gain the most?

Our answer to that question is that the U.S.S.R. would gain the advantage in information. Alertness is the key word for U.S. officials as they examine the proposal. The deliberations of the U.S. oceanographic research institutions involved, the Navy, the intelligence community and the Department of State will be worth watching. We hope they keep their guard up. The safety of the many oil and gas offshore installations is at stake, and there are broader implications from a strategic standpoint for the western allies.□

Star II Submersible Reincarnated as *Makali'i*

During the early and mid-1960s there was a splurge of building small research submersibles. Among them was *Star II*, a two person vehicle. It was built by General Dynamics/Electric Boat and launched in 1966.

As with others, Electric Boat found little call for the small subs and eventually sold it. Its fate was better than some others, however, for it wound up collecting jewelry grade black coral near the Hawaiian Island of Molokai, operating from the Makai Pier at Makapuu Point, the eastern tip of the island of Oahu.

At first the operation was a financial success. Insurance costs eventually caused Maui Divers to abandon the venture. The University of Hawaii bought the vehicle.

After undergoing numerous alterations, it has now emerged as a reincarnation named the *Makali'i*. It was rededicated May 7 and is now embarked on research projects as the Hawaii Undersea Research Laboratory (HURL), a project sponsored by the National Oceanic and Atmospheric Administration (NOAA).

Operating with a transport-launch-recovery vessel, *Makali'i* is operating with scientists aboard, initially collecting sea plants near Molokai for study as to their usefulness in making pharmaceuticals.

Next month an expedition will go to Eniwetok Atoll, 2,400 miles southwest of Hawaii, to study continued effects of nuclear weapons testing. Studies below scuba diving depth never have been made there before. *Makali'i* can dive to 365 meters.☐

Saab-Sub Now *Sea Dog*, Available From SUTEC

The Saab-Sub System, purchased earlier this year by Scandinavian Underwater Technology (SUTEC), Linkoping, Sweden, as part of the entire Saab-Scania Underwater Technology Program, has been renamed the *Sea Dog* and is now on the market. The *Sea Dog* is a heavy-duty, remote controlled tethered platform designed for underwater operations down to 700 meters (see *ST*, March 1981, pg. 60).

Included in the purchase was a lightweight (73 kg) submersible, the *Sea Owl*, now also on the market. This submersible is equipped with lighting and a television camera and is linked to the surface via an umbilical cable. It can be used for offshore observation work, salvage operations and platform or pipeline inspection work down to a depth of 150 meters, or deeper with modifications.

It is the fourth generation unit based on original designs of the Saab-Scania Aerospace Division, Sweden, and is equipped with six electrically-driven propellers for a high degree of underwater mobility.

SUTEC currently has one *Sea Owl* on order for the Swedish Navy (August 1981 delivery) and is building two speculative units. The cost per unit is $110,000.☐

))) **Rechnitzer to join Lockheed.** Dr. Andreas B. "Andy" Rechnitzer, head of the Interagency and International Branch under the Oceanographer of the Navy in the office of the Chief of Naval Operations, will resign the post July 31. He will become manager of the Lockheed Ocean Science Laboratories at Carlsbad, Cal., 25 miles north of San Diego, on Aug. 3. The Laboratories are part of Lockheed Ocean Systems, San Diego, whose director is Robert A. Tyrrell. A recent reorganization brings all of the Lockheed Corporation marine and environmental science capabilities into one organization under James G. Wenzel, vice president, Ocean Systems, Lockheed Missiles & Space Co., Sunnyvale, Cal. Rechnitzer will be in charge of more than 50 scientists, engineers and technicians who conduct marine surveys, study the nearby marine biology for coastal power plants, perform bioassays and who will continue research on ocean mining.....Rechnitzer gained his Ph.D. in zoological oceanography from the Scripps Institution of Oceanography in 1956. In the late 1950s he was with a company that developed a rigid rotor helicopter. In 1959 and 1960 he was chief scientist for the dive of the submersible *Trieste* that established the world's depth record of 35,800 feet in the Marianas Trench. From 1961 to 1970 he was with Ocean Systems Operations of North American Aviation (now Rockwell International) where the *Beaver MK IV* was developed. In 1970 he moved to Washington, joining the Deep Submergence Systems Division (OP-23) under the Chief of Naval Operations. In 1974 he joined the Oceanographer's staff. Active in professional paper review committees of the Marine Technology Society, he was for the past year chairman of the Washington chapter. An accomplished scuba diver, for many years he was president of Cedam International, and is a member of the Sea Space Symposium.

8/81

More 'Vents' Found In Ocean Floor

By STEVE LaRUE

Staff Writer, The San Diego Union

Scripps Institution of Oceanography scientists aboard the research vessel Melville have discovered a fourth series of hot water vents, this one on the ocean floor several hundred miles from Easter Island, where several heretofore unknown marine life forms congregate.

The peculiar vents, where mineral-laden seawater at temperatures of from 72 to 660 degrees Fahrenheit gushes from the ocean floor, were located last week. Cameras towed by the Melville spotted the vents almost two miles deep in a geologically active area of the eastern Pacific Ocean 20 degrees south of the equator.

Such vents, and the comparatively lush plant-and-animal communities that thrive near them, were first found in 1977 in another area of volcanic activity off the Galapagos Islands. Two others were subsequently discovered off the western coast of Mexico.

"It is the first example of any ecosystem that does not ultimately rely on the sun," said William Smithey, a Scripps staff research assistant.

Ecosystems on land are based on plant life, which depends upon the sun. But the base of the food chain in these deep-sea ecosystems appears to be bacteria that feed on hydrogen sulfide and methane gases absorbed in the hot water "soup," Smithey said.

Marine life normally is sparse at these depths because the seawater temperature is near freezing and practically no light penetrates from the surface, said Jacqueline Parker, Scripps information specialist.

Cracks in cooled lava cover the sea floor in the areas where the vents have been discovered, allowing seawater to circulate deep into the earth, where it is heated. The water then percolates to the surface.

Among the unusual life forms:

— A red-tipped worm, about 2 inches in diameter and up to six feet long, that huddles close to the vents. Bacteria in the worm's body consume hydrogen sulfide, which the worm appears to absorb from the hot-water mineral "soup." Research ships had dredged up such worms as early as 1966 but scientists did not know where and how they lived until the first vents were discovered.

— A giant clam, about a foot across, that, like the worm, appears to exist at all discovered vent sites. Clams of that size were heretofore unknown at this depth.

— Several new species of limpets, small shellfish that usually cling to rock surfaces.

— Two species of fish. One is a pink fish more than a foot long that was known to live only at the Galapagos Island vent site. Another is a smaller, white fish that was known to occupy a vent site about 200 miles off the Mexican coast. Both appear to occupy the Easter Island site. These fish appear to exist close to the vents. Scientists do not know how or what they eat, Smithey said.

— A curious-looking growth on old lava flows which was not noted at other vent sites.

Biologists also are wondering how these life forms populate the vent areas, and why some species exist at one site and not at another.

The Melville's expedition is sponsored by the National Science Foundation. Chief scientists are Drs. Harmon Craig of Scripps Institution, and Robert Ballard of Woods Hole Oceanographic Institution in Massachusetts.

Harbor Branch Submersible Completes 1000th Dive

The Harbor Branch Foundation submersible, *Johnson-Sea-Link 1*, made her 1000th dive in February while on a routine scientific mission in the Bahamas. The first dive made by the *Johnson-Sea-Link 1* was during her christening ceremonies on January 12, 1971.

Occupants of the Johnson-Sea-Link for the 1000th dive were Chief Submersible Pilot, Tim Askew and Scientific Observer, Dr. Robert S. Jones. In the aft dive compartment were Dive Tender Christopher Chulamanis, and Scientific Observer Christopher Donohoe, all staff members of Harbor Branch Foundation.

Harbor Branch Foundation operates submersibles exclusively for scientific research. Their *Johnson-Sea-Link* submersibles have made many major contributions to the advancement of man's knowledge of the marine environment. Some of the projects undertaken include over two month's work on the wreck of the Civil War ironclad *Monitor*, which lies in 70 meters of water off the coast of North Carolina. Johnson-Sea-Link submersibles have also been used to conduct baseline studies in the deep reef structures of Florida's marine sanctuary at Pennekamp State Park, in the Georges Bank area off Cape Cod, Mass., and in the Gulf of Mexico at the Flower Garden marine sanctuary off Galveston, Texas. Through these submersible activities many new species of marine organisms have been discovered and documented.

In other Harbor Branch developments, on March 9 Penny Hall, a phycology research assistant, made a 20-minute lockout dive breathing a 10 percent heliox mixture. She dived from the *Johnson-Sea-Link 1* lockout submersible. The dive was made in support of algae collection off St. Lucie Inlet, Fla. Ms. Hall thus became one of the very few women to have locked out of a submersible to such a depth while breathing heliox.

EXCLUSIVE STATE DISTRIBUTORSHIPS and County Dealerships available, worlds smallest safest submarine, see our ad "Taylor Commercial Submarine Mfg. Inc., 4479 122d Ave., Clearwater, Fla. 33520. (813) 576-8688, 334-4040. T7-11.

OMB Used To Free Trapped SAIPEM Submersible

by Michael Mulcahy
Managing Editor

Last November an event in the Mediterranean had a happy ending when a submersible became entangled, and possible loss of life was averted by quick action and the availability of an Observation Manipulator Bell (OMB). *ST* picks up the story on November 14, 1980:

SAIPEM's Perry-built diver lockout submersible PC-1602 was conducting a survey on a stretch of the Trans-Mediterranean Pipeline in the Sicilian Channel between Tunisia and Sicily. In the course of making passes over the pipe section, the sub's propeller became entangled with a soft line attached to a weighted drum. Fast action from the surface support ship *Ragno Due's* crew put the sub back on deck within four hours after notifying the surface of distress.

The accompanying log captures the sequence of events best.

Key Events

November 14th - 1980

0446 PC 1602 launched for dive no. 71 (survey of pipeline).

1545 Sub on bottom (about 122 m away from pipeline).

0602 Sub at joint 4005 of line 2S. Flat bottom. Depth 530 m

0640 Sub moving along pipe. Measured free span existing under joint 4002. Sub ready to move further.

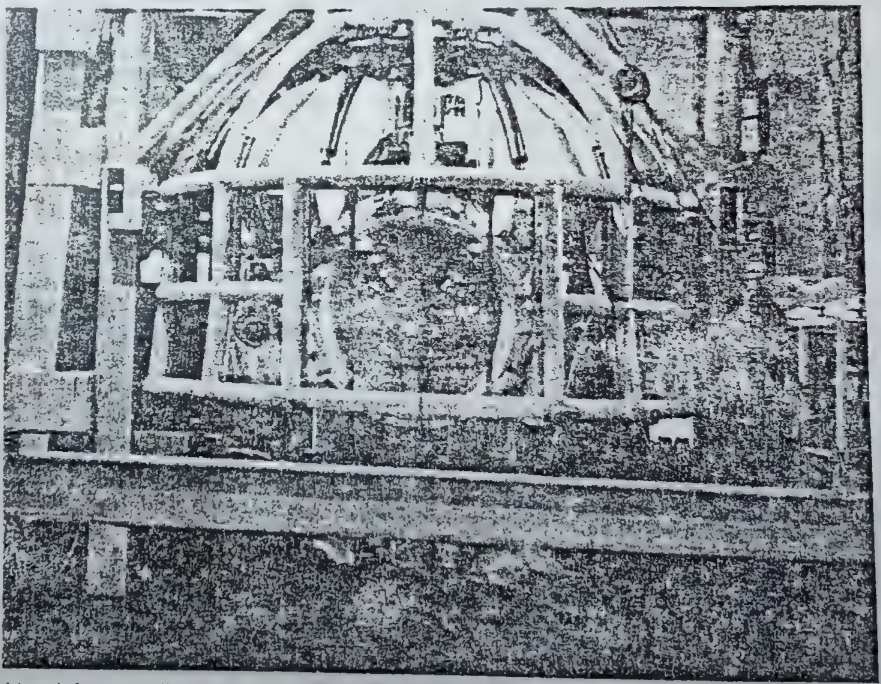
0710 Message from PC1602. Sub is apparently entangled on the bottom and cannot move. Further messages to inform surface that coupling between gear box and shaft seal is broken.

0712 At surface, pilot and co-pilot for OMB called and advised to be ready in 15 minutes for pre-dive briefing. Mechanical staff advised to prepare cutting wheel and related hydraulic tool for installation on OMB. Evaluation of life support supplies on PC1602. Crew advised on best oxygen level and how to save electric power on 24/120. Surface supervisor moves controls from sub control room to OMB control room. Underwater telephone transducers from OMB control room deployed for communication check with sub (OK). Shipmaster informed. Ship moves to position on top of PC1602 and keeps position on DP. Messages between sub and surface to evaluate situation. Steel cables, including a guide line to be used as reference during pipe laying, are in the area. No exact evaluation possible. Entanglement due to steel cable or soft line.

0728 Pre-dive briefing in OMB control room. OMB pilot and co-pilot informed, advised to prepare OMB with hydraulic cutting wheel, sharp knife on advance manipulator, extra knife ready for use.

0740 Sub trying to come up on empty

(Continued on page 41.)



Used for the first time in underwater construction, Perry-built Observation Manipulator Bells (OMB) played a key role in the laying of the Trans Mediterranean Pipeline by SAIPEM. The pipeline, completed in late January, extends from the coast of Tunisia to the Italian mainland, crossing Sicily. The versatility of the bell was demonstrated graphically when it successfully freed SAIPEM's submersible PC-1602 from entanglement.

trim tanks. No further movement possible. Sub advised to remain on stand by, with power off on 120 and minimum on 24 (UQC, gyro, scrubber, clock).

0810 Pre-dive checks completed on OMB. Cutting wheel checked and ready for deployment, sharp knife installed on jaws of advance manipulator, extra knife ready for deployment on grabber. Further controls completed. Hatch closed. Bell ready for launch.

0820 Surface supervisor and deck officer in OMB control room with double communication system (hard wire communication system for OMB, communication system on 27 kHz for PC1602 and OMB).

0825 OMB launched. Dive no 49.

0845 OMB at 305 m. PC1602 with lights on.

0846 OMB at 512 m. In sight of sub lights.

0850 OMB near bottom. Moving close to sub for inspection.

0859 OMB getting closer to stern of PC1602. Soft line noticed. It is fouled around propeller and other end is connected to a drum filled with concrete and stones. Between sub and drum is pipeline. The drum has been dragged on the bottom for about 6-8 m.

0920 OMB is exactly positioned near stern of PC1602 on wireless 27 kHz. After evaluation OMB is asked to get ready to cut line with knife installed on manipulator jaws. Line is tensioned between sub propeller and drum.

0932 PC1602 crew informed to fill trim tanks with water.

0933 Soft line severed by OMB.

0935 OMB moving around sub for further inspection.

0937 OMB moving around sub OMB leaves bottom. PC1602 keeps position on stand by.

0952 OMB at 61 m.

1006 OMB recovered. PC1602 still on stand by on the bottom.

1007 Transducers for wireless communication sytem in OMB control room recovered. Communications and controls for sub moved back to sub control room. Ship moves to better position for recovery of sub.

1015 PC1602 leaving bottom on trim tanks only. Pilot ordered not to use any propulsion.

1048 PC1602 at surface.

1056 PC1602 recovered. On aft deck of ship.

Ship master: E. Marinelli
Surface supervisor: J.E. Melegari.
Deck officer: A. Piccini.
PC1602 crew: G. Bezak (pilot), P. Mauri (co-pilot).
OMB crew: R. Boraso (pilot), A. Piras (co-pilot).
PC1602 handling sytem: R. Boraso.
OMB hadling system: P. Gessner.
Mechanical staff: F. Bouger, P. Gessner.

Submariner readies descent to Titanic

NEW YORK — Inventor Fred Koehler Jr. has completed plans to descend to and board the Titanic in the spring of 1981 in a revolutionary new deep sea diving vessel which his company, Sea Spot, designed and manufactured. Koehler, owner and president of the Coral Gables-based marine research company said the dive will take place exactly 69 years after the luxury cruise ship sank off the coast of Newfoundland with 1,500 passengers aboard.

The unique recovery vessel, called "Seacopter," is designed to complete dives to depths of up to 20,000 feet, a quantum leap over existing privately-owned vessels which can currently not exceed depths of over 6,000 feet.

"Seacopter," which is shaped like a mosquito and has the maneuverability of a helicopter under water, can descend to the sea floor where the Titanic rests in 1½-2 hours.

Koehler has spent seven years and has invested $700,000 to date in readying the specially-constructed craft. Seacopter can hover over the ocean floor at great depths, move up and down with ease and, because it is only 14 feet long, will be able to enter the Titanic and maneuver down the passageways by means of its own tracking system.

The basic plan is to locate the Titanic through the use of a megtometer and side-scan sonar. A cable will then be lowered and the Seacopter will ride down the cable to conserve power and spend the first six to 10 hours surveying the Titanic by filming and videotaping the entire vessel.

The craft's power is developed by a unique design battery system composed of silver-zinc cells.

Outside and inside motion picture cameras with lights and a built-in videotape unit insure that the historic moment will be captured on tape and film. A package of outside cameras will be planted on the hull of the Titanic along with a battery of lights so that both the Titanic and the Seacopter will be recorded.

Remotely Controlled Underwater Trencher

In conjunction with Naval Facilities Engineering Command's Ocean Facilities Engineering Research and Development Program, the Civil Laboratory at Port Hueneme, Calif., is advancing the state of the art for a remotely controlled underwater trenching vehicle.

The vehicle will cut a trench through sand, granite or ice, place prelaid cable or pipe in the trench, and backfill the trench, all in one operation.

8/8

Titanic Expedition To Set Sail June 15 For Newfoundland

ABILENE, Texas (AP) — Oil millionaire Jack Grimm, sponsor of the expedition that reported finding the sunken Titanic last summer, says he will set sail in June to pin down the exact location of the luxury liner and explore its hulk.

"This voyage will be for all the marbles," Grimm said Monday.

Grimm, known as "Cadillac Jack" in gambling circles, said he will set sail June 15 from Boston. With him will be Tampa filmmaker Michael Harris, who conceived the idea of searching for the Titanic and who led the expedition last year.

The summer expedition off Newfoundland located what Grimm said he believes is the Titanic, but heavy storms and equipment problems forced the expedition to turn back before positive identification was made.

The initial goal of the expedition this summer will be to establish the exact location of the ship, which sank in 12,000 feet of water after hitting an iceberg on its maiden voyage in 1912. The disaster resulted in 1,517 deaths.

Then the crew plans to explore the hulk itself. Millions of dollars worth of diamonds and gold are believed to be in the purser's cabin of the ship.

The crew will sail on a Texas A&M University research vessel, the Gyre, which carries a "seacopter" which can dive to 20,000 feet and can remain submerged for three days, Grimm said. The vessel may be used to bore a hole in the Titanic's starboard side to reach the purser's cabin.

Detachable metal pincers resembling claws can pick up valuables inside the cabin, as well as those lying on the ocean floor, he added.

Heavy Seas Hinder Hunt For Titanic

ABILENE, Texas (UPI) — High winds whipping up 10-foot waves yesterday prevented explorers from reeling in cameras that may tell whether a large chunk of metal on the floor of the North Atlantic is part of the sunken luxury liner Titanic.

Abilene oilman Jack Grimm, leading the expedition aboard the research vessel Gyre, also reported that additional dragging in an area known as Titanic Canyon disclosed the presence of other large pieces of metal in the immediate area at a depth of 13,000 feet.

"We hope to have (the cameras) aboard (today) and learn the answer," Grimm said from aboard the Gyre.

He said pulling up the cameras was a two-hour process, "even in good weather."

The largest chunk of metal, estimated at 500 tons, was detected several days ago through the use of equipment lowered on drag lines.

It was feared the cables used to reel in the cameras would snap because of the heavy seas.

Titanic Search Resumes

WOODS HOLE, Mass. (AP) — The vessel Gyre set sail yesterday for a nine-day search in the North Atlantic for the sunken luxury liner Titanic.

The voyage marks the second attempt by the ship's crew of scientists to find the Titanic and the $300 million worth of diamonds believed to still be aboard.

Specifically, the Gyre's crew will try to determine if one of 14 sonar-scanner photos made last summer near where the ship went down is of the Titanic.

The "unsinkable" Titanic struck an iceberg on its maiden voyage from Europe to the United States and sank April 14, 1912, in 12,000 feet of water, 330 miles southeast of Newfoundland. An estimated 1,500 people went down with the ship.

Dr. Fred Spiess of UCSD's Scripps Institution of Oceanography said this summer's expedition will work on information collected at the site last year.

"In the beginning there was the navigational information they sent out at the time they sank," he said. "Last year we went out with a long-range sonar system and and covered an area about a dozen miles in radius around that point and found some very likely-looking spots.

"We're going back now and work over those individual patches. It shouldn't take us too long to work through that — a week or so, probably."

The search is led by Michael Harris, head of International Expeditions of Tampa, Fla. He said that if the Titanic is found, the plan is to call in the 51-foot submarine Aluminaut, owned by Reynolds Aluminum, for next summer's expedition.

"The Aluminaut is equipped with exterior arms that can stretch nine feet," said Harris. "It could reach into open areas of the Titanic and recover some artifacts, possibly even some valuables."

Abilene, Texas, oilman Jack Grimm is financing the multimillion-dollar search, and has laid claim to whatever valuables are recovered.

Grimm has backed expeditions seeking Noah's Ark and the Loch Ness monster — both unsuccessful. He said he expects to get his investment back through a book and a film about the search for the Titanic.

Titanic Search Fails Again

BOSTON (AP) — The search for the wreck of the Titanic has failed for the second year in a row, leaders of an expedition said yesterday.

But now that adventurers and scientists know "where it's not," they say they hope to probe the North Atlantic again for the ill-fated luxury liner.

"I'll never rest until we've solved the secrets," said Jack Grimm, the Abilene, Texas, oilman who paid for the search.

After a 10-day expedition, the 174-foot research vessel "Gyre" docked here yesterday morning, carrying photographs and videotapes of objects reseratchers believed to be manmade, including what could be a piece of the Titanic's huge propeller.

The Titanic smashed into an iceberg on its maiden voyage April 14, 1912, claiming 1,513 lives. It lies under 12,000 feet of water, reportedly with millions of dollars worth of diamonds aboard. Experts do not know whether the vessel is intact or broken in pieces.

"I won't give up until we go back and comb the area again," said filmmaker Michael Harris of Tampa, Fla., who headed the expedition. "If we search long enough we will indeed find the Titanic."

William B.F. Ryan of Columbia University also said, "It's there. It's not like Noah's Ark." He and Fred Spiess, of the University of California, were the chief scientists on the Gyre, a Texas A&M University sh

Last summer, Grimn team isolated 14 "target where they could search f the Titanic. This summ the team searched the ta gets and came up emp handed.

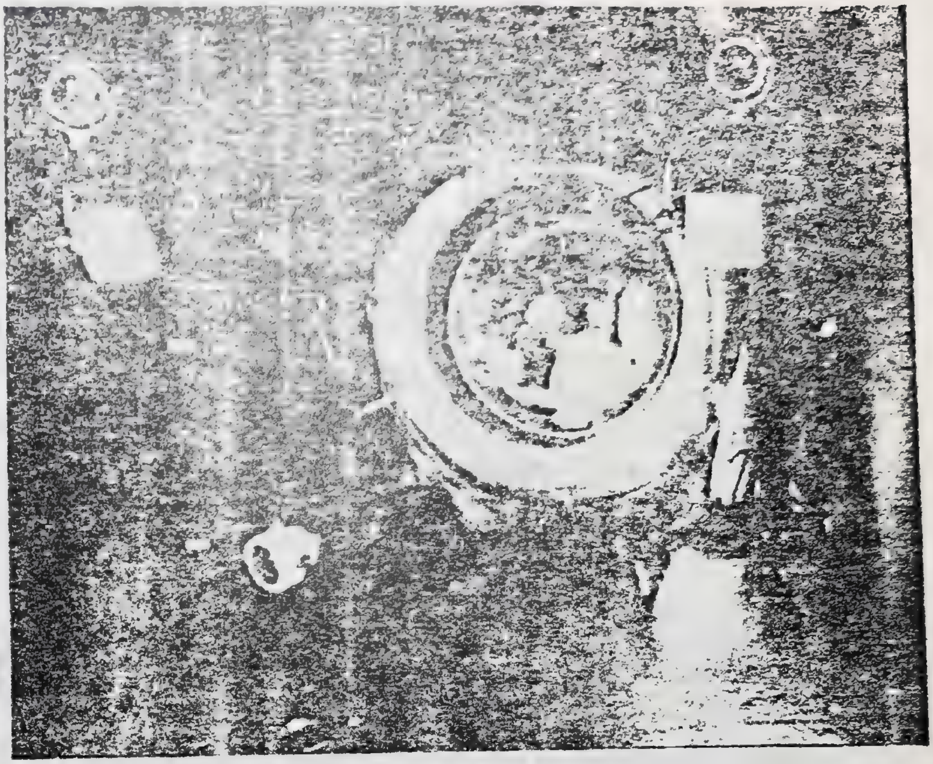
Researcher Mark Olss said there now is doubt t Titanic is near the sp from which it radioed last SOS. If it is not the hundreds of square mi could be added to t search area.

But Harris said at a doc side news conference he l lieves the team sim "missed it. After all, do on the ocean floor, it's l searching a darkened fo ball field with a penlight.

Ryan, however, said team's findings provide evidence of a large int luxury liner."

The searchers "fou some tantalizing clue Olsson said, adding, "W we know now is where not."

THE MURKY FACTS OF SUBSEA LIFE



Subsea surveying of North Sea pipelines takes place in water depths from 100m to 170m where good visibility is vital for video and still photography. This is not always possible because of seabed silt which rises easily in suspension to blind a submersible's observer and pilot. And this is a minor disturbance compared to the silt swirling caused by a jetting barge.

Trenching can cloud the waters for up to three days after an operation is finished. Deep water currents which could clear the area are unpredictable and even if they whisk the silt away they could also return it to the scene of the submersible's operations.

Ideally, surveying should either line into the current or cross it, a situation not always practicable. Besides silt, plankton and fish congregate near a pipeline, seeking its warmth, and again obscuring an observer's vision. Plankton causes photographic backscatter and the gleam of fish 'flare' a low-light video camera.

Silt, fish and flaring apart, currents continually disturb a pilot's submarine flying. Maintaining steady distance between a pipe crest and submersible instruments is disrupted by currents which try to turn the vessel at one of its periodic halts. (These stops are necessary to change video and data tapes, for example.)

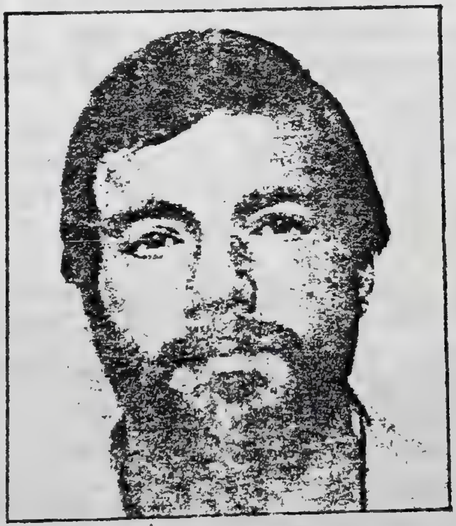
Topsy-turvying by currents is worst in a narrow trench and could even lead to a deep water crash. It may mean damage to an instrument such as the camera or one of its vital floodlights. One attendant hindrance is the simple waste of submarine battery time.

Preferable though a head-on current is, it demands more power from batteries which are drained at a faster rate. Dive time is pared. Furthermore transverse currents mean continual battling to keep position on above or at the side of the pipe. Any current at more than ¾ knot creates problems, whatever the direction.

Problems with the environment are well known by experienced operators and nowhere is the situation more complex than in the inter-relationship between environment, camera and lighting. Ambient light is discounted below 50m depths, so submersibles are fitted with optional combinations involving spotlights and floodlights. Up to seven could be mounted on the front of the submersible, the number dictated by the availability of penetrators, and for a fully-equipped submersible this can be a restricting factor.

Dependent on available hydraulics, some units can be fixed on pan-and-tilt units similar to external TV cameras; or they may be mounted internally. Both cameras are of the low-light variety.

With these possibilities lighting can be strategically arranged for varying situations which may never occur during the ever-changing conditions during an eight hour dive. Carefully-angled floods designed to bounce light on to the pipe from trench walls become useless when a trench 'vanishes' and the pipe is exposed. Spotlights angled high and forward to avoid flaring again prove ineffective when unexpected plankton causes backscatter.



Alan Homer, i, r & m consultant.

So achieving perfect video is a virtually insoluble problem with today's technology. The best option is to have as many lighting alternatives as possible.

For underwater still cameras there are technical problems such as leaking connectors and cabling, condensation, distortion and rough use. However, offshore it is the vogue to develop, enlarge, and print photographs on board the mother ship. Frustratingly this is time-consuming compared with monochrome. Colour of the photographs could be subject to the whim of a darkroom technician with his filters. Also a print may be altered by a client's representative who most likely has never seen the subject.

It is therefore difficult to advance valid technical reasons for the use of underwater colour photography for engineering purposes. Also production of an exquisite print in a seaborne darkroom is no easy matter

Data acquisition also is subject to criticism when it involves data presentation by computer print-out. Such print-outs are often criticised for gaps in continuity. When looking at neat lines and crosses on graph paper it is easy to forget the conditions which hindered acquisition of the raw data –patches of no visibility, transverse currents, inshore swells driving the submersible into the seabed, and condensation after eight submerged hours which caused the VTR to jam.The list is endless.

Finally there is fatigue which causes human error. This is a telling factor affecting the non-stop 12h work, in a tiny, cramped submarine, topped by more work on the surface.

Five small research submersibles have now reached, or passed, the magic number of dive 1000. They are: ALVIN, JOHNSON SEA LINK 1, PISCES II (VICKERS PISCES), PISCES III, and PISCES IV.

ALVIN is operated by the Woods Hole Oceanographic Institution for the U.S. Navy and the National Science Foundation. She was built by General Mills/Litton Industries and launched in 1964. She is capable of diving to a depth of 13,000' and made 14 dives to that depth in 1980. Her 1000th dive went to a depth of 2387 meters on 1-15-80. Her last reported dive at this date is #1092.

JOHNSON SEA LINK 1 was built by the Aluminum Co. of America and was designed by Edwin Link. It is operated by the Harbor Branch Foundation of Riviera Beach, FL for its owner, the Smithsonian Institution. The Harbor Branch Foundation just celebrated their 10th Anniversary on May 30th. The JOHNSON SEA LINK 1 reached the 1000 mark on 2-21-81 during a dive in the Bahamas to a depth of 350'.

PISCES II, III, and IV were built by International Hydrodynamics Co. of Vancouver, Canada. This company went into receivership and most of its assets were purchased by Canadian Undersea Vehicles. One of the original PISCES designers, Mack Thomson, is head of the new company.

PISCES II was launched in 1968 and was subsequently sold to Vickers Oceanics, whose assets were taken over by British Oceanics Limited. We don't know the exact date of P II's 1000th dive, but they had documented dive #1652 on 9-3-80 with a depth of 1150' at Gibraltar.

PISCES III was launched in 1969 and was also sold to Vickers, and now is owned by British Oceanics Limited. We don't know the date of her 1000th dive either, but we do know she made dive #1648 on 1-12-81 to a depth of 460' in the Straits of Sicily.

The 5th submersible in the exclusive 1000 club is the PISCES IV. She was built for the Canadian Department of the Environment and was launched in 1971. Her 1000th dive came on 3-9-81 and was a "dip" to 90 meters.

May 12th. "ALVIN is being put back together now in preparation for test and re-certification. LULU is still in the shipyard but will probably return this weekend with a lot of new paint and much routine work and some modifications. Group is scheduled to sail now on the first of June for checkout and Navy certification south of New England. One more trip is slated out of Woods Hole before heading south. That will be from 6-18 through 7-3 and will be a canyon geology cruise on the edge of the shelf south of Nantucket. Departure from Woods Hole for Panama is scheduled for 7-13. They will go directly to Panama and will by-pass the Bahamas. This cancels the dives off Bahamas, so all those who sent Bahamian stamped covers will have to wait until the next trip. They hope to arrive at Panama on the 26th. Three trips are scheduled for the Panama Basin and Galapagos areas. So, do not send any more Bahamas stamped and please no more for Panama as of the next issue. I will take Costa Rican and Mexican any time."

Allan Witcombe sent an up-date on the PISCES IV activities as follows..."PISCES IV has been fully involved in operations since dive #1000 but will cease West Coast operations about April 20th in preparation for deployment to the East Coast.

Dive #1000 was an event we had long looked forward to and we celebrated it with champagne and a superb buffet dinner on the PENDER. Frank Chambers and Bob Taylor made the dive along with invited guest Jerry Ewing, Assistant Deputy Minister, Ottawa. The dive was certainly one of the shortest on record and one of the shallowest, but without a doubt it was our most celebrated. We look forward now to our next thousand."

Allan writes further that the commemorative plates were packed and stacked all around the sub and there was hardly room for the crew. The original design for the plates was to be PISCES embraced by an octopus but that became a little involved with too many arms. So they adopted a design from our own Hideaki Nakano and in appreciation they are sending him a complimentary plate. I really think that is great...that one of our people could contribute to such an important event.

The sub will spend 6 weeks in refit after April 20, and will be getting a new hydraulic system, new batteries, and a new video system. Also they will improve their payload with the addition of foam.

About June 13th the schedule calls for dives in the Gulf of St. Lawrence, then down to Bermuda, Bahamas, and the Cayman Islands with return through the Panama Canal about Dec. 1st.

British Oceanics Ltd's (BOL) submersibles *L-1* and *L-2* have recently completed two support operations. One job entailed detailed sonar and visual surveys for Texaco on the **Tartan** field including surveys to a radius of 100m around the two wellhead sites, located east and west of Tartan A at a distance of 3½ to 4km from the platform, prior to supporting laying operations of the 6in. flowlines from the pipelay ship, *Apache*. Trenching and spoil removal was carried out by the submersibles using high pressure water jetting from the platform, enabling continuous spoil removal over extended periods.

Operating from the mother ship, *British Viking*, the units then placed transponders and site surveys between the two pipelines for positioning of the bottom drilling template from **Claymore** to the **Piper** and Tartan fields at a depth of 350ft for Occidental. Side scan survey of the area, line tracking and video inspection of the pipelines and grid searches to Oxy's specifications and bathymetric readings were also provided.

A new depth record for an atmospheric diving suit (ADS) made by Steve Etchemendy was established in January when Oceaneering's WASP ADS reached 1780fsw in the Gulf of Mexico. WASP is rated for operating depths of 2000ft.

The world's first operational submersible powered by a closed cycle diesel engine (CCDE) was given its first major airing at October's EEC diving safety symposium in Luxembourg. A prototype *PH-C02* was photographed during sea trials (above).

The danger of harsh sea conditions to divers supported by a dynamically positioned mother ship is cited by developer Sub Sea Oil Services as the main impetus for its eight-year Phoenix project. The first such operational submersible, the 11m long × 3m high × 3m wide *PH-1000/1*, powered by two 90hp CCDEs, is ready for first work next month.

Symposium delegates heard that the 12-knot vehicle had increased the diver lock-out time from 4 hrs using a traditional submersible, to some 24hrs. The PH-1 class accommodates four saturation divers and needs a tender ship only for position monitoring and communications. It also provides a 'realistic' method of hyperbaric rescue for up to 10 divers, according to SSOS. The heat source is 'virtually unlimited', and the submersible could even be launched from an offshore structure.

The underwater industry has for years sought a self-contained solution to subsea working, and the presentation, made by Micoperi's Dr Brunner was received enthusiastically.

'There will be considerable applications for this techniques.' Cmdr Warner later commented.

Two further classes are to be introduced. PH-2 will carry 11 saturation divers down to 500m, or in atmospheric mode it could operate down to 2,000m. PH-3, more like a submarine with a 22-strong crew, is planned to handle 24 days' saturation endurance.

According to SSOS total annual inspection expenditure in the North Sea will be £105 million by mid-1980s. Nor have possible deep sea mining applications been overlooked.

SAN FRANCISCO (AP) — The Glomar Explorer, used as a CIA spyship in the mid-1970s, is being taken out of mothballs to look for oil and perform basic geophysical research, officials said.

The National Science Foundation and 10 oil companies are financing the venture, scheduled to begin after a three-year major overhaul of the 619-foot vessel, now at anchor in Suisun Bay near San Francisco.

The ship's derrick, after remodeling, will be able to lower a drill string through 13,000 feet of water and then through up to 20,000 feet into the earth's crust, or deeper into the seabed than anyone has drilled before.

The mission will be known as the Ocean Margin Drilling Program.

In 1974 and 1975, the ship was used by the CIA in an attempt to recover a Soviet missile-carrying submarine that had sunk in 17,000 feet of water 750 miles northwest of Hawaii. The ship, owned on paper by Howard Hughes' Summa Corp., was supposedly on a mission to mine manganese from the ocean floor.

HMB SUBWORK LIMITED

HMB SUBWORK is a British Company established to operate underwater equipment for the Offshore Industry. HMB SUBWORK operates the Mantis one-man tethered submersible, a second generation submersible developed by the OSEL Group of Great Yarmouth, with the accent on safety as one of the key factors.

Mantis

Mantis has a full mid-water capability and in addition to its observation role is essentially a highly manoeuverable work-horse, robust yet versatile with its two manipulators. A number of tools can be added to the basic submersible to suit clients' requirements. The submersible is supplied as a total package which consists of the submersible, control cabin, lifting mechanism and power pack. It is a quick operation to install the package on a platform or ship.

Number available

HMB SUBWORK operates all the Mantis submersibles manufactured to date and a further one is being built for this season. Therefore, full back-up is available at all times.

Technical Support

Technical support and spares back-up is provided by the manufacturer.

Cost Effectiveness

Mantis is considerably cheaper to operate than either:

1) A team of saturation divers.
2) A larger manned submersible which needs a specialist support vessel equipped with sophisticated handling gear.

The daily hire rate is comparable to that of an RCV but its advantages over an RCV are:-

1) Mantis is manned thus has all the advantages of a manned submersible.
2) Positioning on RCV is often difficult from the surface. With Mantis the man in the submersible is able to exercise more positive and better overall control.
3) RCV's often become trapped and are then difficult to release from their entrapped position causing delay to the client and frequently the loss of expensive equipment.

Working Depth and Weather Capability

Mantis can operate between sea level and 610 meters. Although tethered it has a large working area or 'footprint' at all depths, and the added advantage of real time communications and video recording.

Weather capability is in sea conditions up to seastate 6.

Safety

The basic design philosophy is safety, and the following features are incorporated -

Primary Safety:

a) Pressure Hull design and testing exceed any known current regulations.
b) Intrinsically safe Pressure Hull environment. All potentially dangerous materials and energy sources such as hydraulic oil, compressed air, voltage above 40 volts, currents above 4 amps, all high pressure fluids are totally excluded.

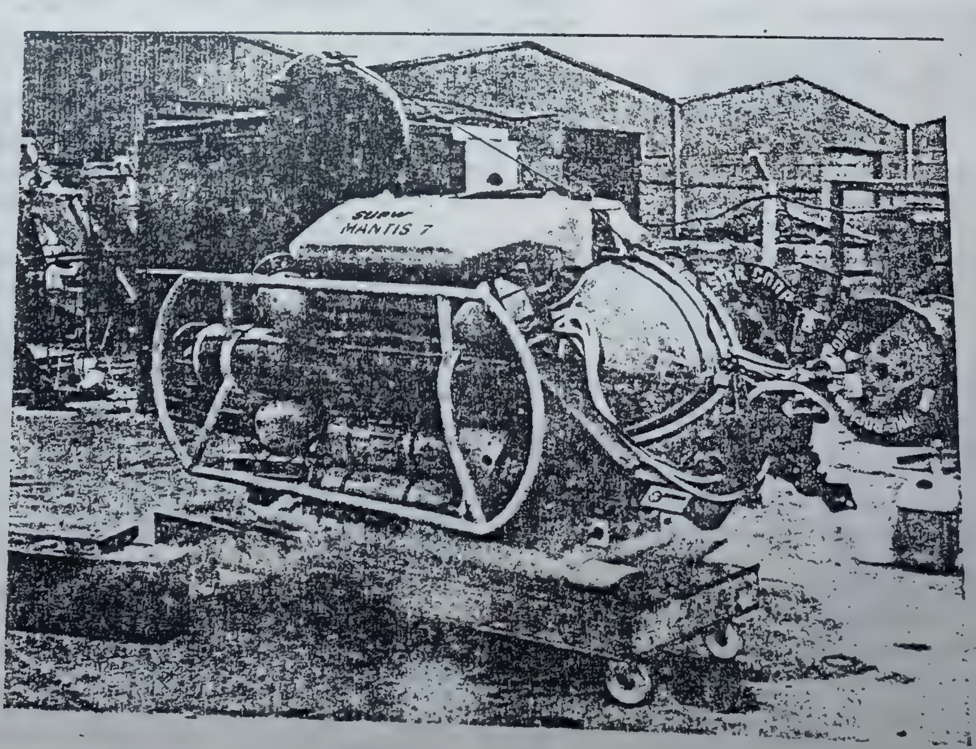
Life support duration under normal usage is at least 72 hours; Mantis has two separate scrubber units and an oro-nasal mask.

Secondary Safety:

Redundant and Duplicated Systems:

The Mantis has at least dual systems on most of its sub systems; the following are examples of these:

1) Life support
2) Propulsion
3) Buoyancy
4) Weight drop
5) Main Power supply module
6) Emergency batteries
7) Instrumentation power supplies
8) Manipulator power pack



Emergency Systems:

1) Total autonomy is possible with all systems fully functional should the pilot choose to jettison his umbilical cable. Even then dual emergency propulsion batteries and systems are available.
2) All externally fitted equipment is jettisonable. In an extreme case the pilot would be left safe within a smooth, snag-free and very buoyant life support capsule.
3) The under-water communications equipment is fitted with a pinger/transponder locator and an emergency pinger.

Personnel

The Management of HMB SUBWORK all have many years experience of the subsea engineering industry in the more technical underwater areas, and in particular submersibles. The transformation of the Mantis project from the prototype stage to a fully proven oil field work system has been due in no small measure to their expertise.

Capabilities

Inspection and Maintenance:

Pilots' all round vision through the hemispherical dome, coupled with the precise manoeuvreability of Mantis makes it an ideal vehicle to operate round platforms and jackets.

When used for inspection work a hardline video system gives real time viewing both on the surface and in the submersible. When coupled with pilot commentary on video recordings it gives the client a permanent record of a broad spectrum of information.

The hardline communications system enables the pilot to make alterations during the dive as instructed by the client, to suit changing conditions or to re-examine salient features. The camera equipment used is black and white or colour video.

a) Potential Readings.
Mantis is equipped to carry a Bathycorrometer to give potential readings where indicated.

b) Ultrasonic Thickness Readings:
In one of the manipulators of Mantis a USM2 ultrasonic thickness testing meter can be held. To enable the submersible to attach itself to structures a third arm, suction pad or grip may be fitted as required.

c) Still Photography:
Mantis is equipped to take black and white and colour pictures.

d) Magnetic Particle Inspection:
A development programme is currently being undertaken to give Mantis an MPI capability. This capability will mean that Mantis will be equipped to perform all the inspection tasks of a saturation diver.

e) Additional Tools:
Up to 1,000 watts power is available to operate a wide variety of special tools.

Exploration Rig Support

Mantis is an ideal tool for exploration rig diving support giving the capability of a diver with the ability to work around the stack at a fraction of the cost. Such tasks as changing an AX ring and changing guide lines are well within its scope. The compactness of the support equipment releases valuable deck space for other purposes.

Platform Construction Support

Mantis is also a very suitable tool for the diving tasks required during the installation of a platform. All the tasks required of the diver during this operation, except burning off pileguides, can readily be accomplished by Mantis suitably equipped.

Pipeline Inspection

Operating from a dynamically positioned vessel, Mantis can inspect pipelines down to its working depth of 610 meters.

---

1. Intersub Services was formed in January 1981 by the French companies SPIE-BATIGNOLLES and SPIE-CAPAG. They have taken over the old premises of Intersub in Marseilles, and now operate PC 1201, Pisces V and Cetus II.

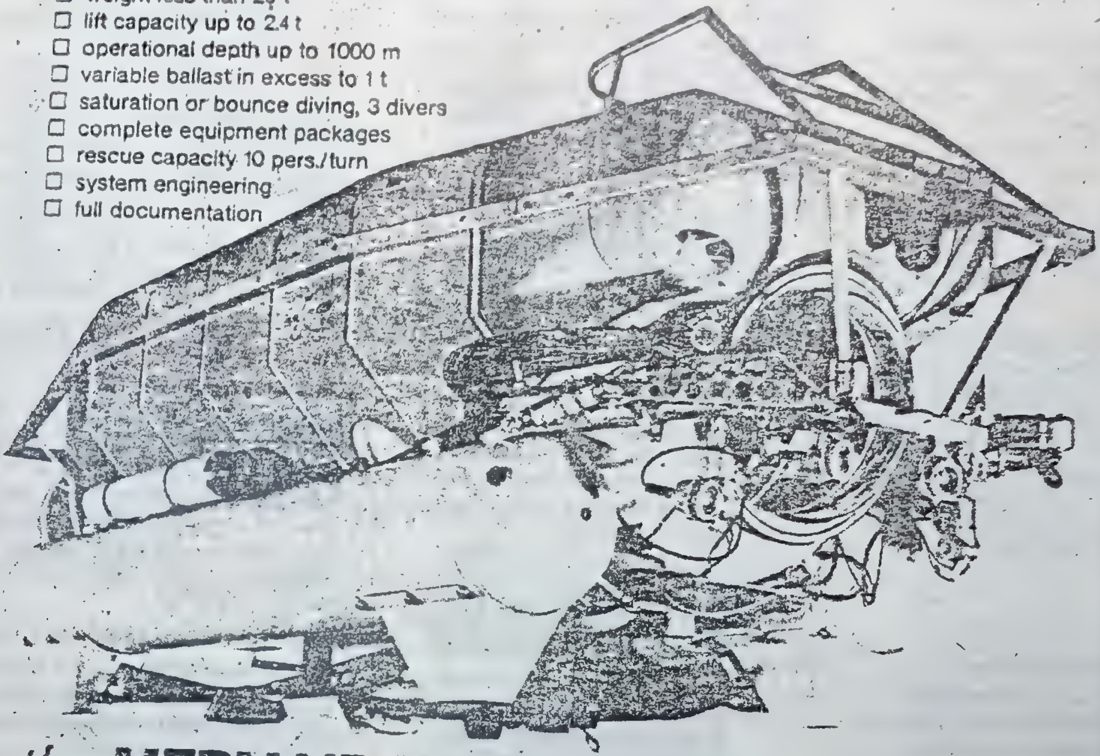
Attempt to Salvage RUWS Thwarted by Huge Boulders. On Jan. 20 the Navy's tethered Remote Unmanned Work System (RUWS) was being operated off the west coast of Hawaii's big island of Hawaii. Somehow the tether parted and the 2,700 kg vehicle, 3.34 m long, 1.37 m wide, sank to the bottom 4,562 m down. The only submersible capable of operating to the depth, is the 6,096 m depth capability *Trieste II*, that operates out of San Diego, Cal. Getting *Trieste* to the sinking site would be expensive. After months of waiting transportation became available and *Trieste* was taken to Hawaii. In its first dive it was found that the bottom was strewn with *Trieste* size boulders. They camouflaged returns of the CTFM sonar so that they all looked like RUWS. The mission was aborted. There is a possibility that the Navy will try to use the towed vehicle *Angus* to make a photomosaic of the sinking area to identify and pinpoint the location of RUWS. *Angus* is operated by the Woods Hole Oceanographic Institution. In late 1982 *Trieste II* will be replaced by the submersible *Sea Cliff* that is being fitted with a titanium sphere enabling it to have an equal depth capability.

A new Breed of
BRUKER *Submersibles*

BRUKER

a versatile concept with a wide range of modifications

- ☐ weight less than 20 t
- ☐ lift capacity up to 2.4 t
- ☐ operational depth up to 1000 m
- ☐ variable ballast in excess to 1 t
- ☐ saturation or bounce diving, 3 divers
- ☐ complete equipment packages
- ☐ rescue capacity 10 pers./turn
- ☐ system engineering
- ☐ full documentation



the **MERMAID VI** *Submersible family:*

- ☐ long range subsea inspection (**SSI**)
- ☐ surface independent diving bell (**DLO**)
- ☐ subsea maintenance and repair (**MAR**)
- ☐ dry and wet subsea personnel transfer (**DWT**)
- ☐ subsea rescue of submarine crews (**SAR**)

Sub Capable of Handling "JIM" Diving Suits

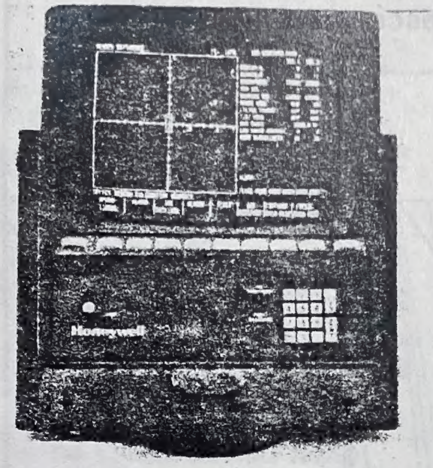
A joint study by Comex and Kockums Shipyards may result in a civilian version of a naval rescue sub as a work vehicle for the offshore oil industry. The submarine, designed to permit the handling of "JIM" diving suits, would permit minimum inspection dives to 460-m depths, diver lock-out work at 300 m and up to 3,000-kg. payloads. 27

COMPANY NEWS

An ambitious new plan for a large underwater habitat on the seabed to serve as a base for divers or small submersibles independent of a surface mother ship, is being developed by **Kockums Shipyard** of Malmo, Sweden in conjunction with **Svenska Petroleum AB** and the **Norwegian Underwater Institue** of Bergen.

Kockums has for some time been working on developing a surface-independent submersible for lock-out diver operations using techniques already established and used in their submarine building. The underwater habitat base would eliminate the problems of working in surface wind and harsh weather conditions. It would operate down to 600m 27

Honeywell Acoustic Positioning Systems



The RS/900 is Honeywell's most recent series of precise acoustic-position-indicating and subsea-tracking systems. Its applications include undersea construction, surveying, tracking of underwater vehicles, site relocation, drill ship positioning, backup acoustic BOP control and surface vessel navigation.

The RS/900 series combines both local and wide-area positioning techniques using beacons or transponders, or a combination of both. The series features an interactive communicative display console and keyboard to lead an operator through setup, operation and maintenance.

IUC Buys One Man Submersible From Offshore Systems Engineering

Offshore Systems Engineering Ltd., Great Yarmouth, U.K. has sold the Mantis S/N 009, their deepest diving one-man submersible to IUC International, Inc. The submersible was scheduled to be available for lease this month.

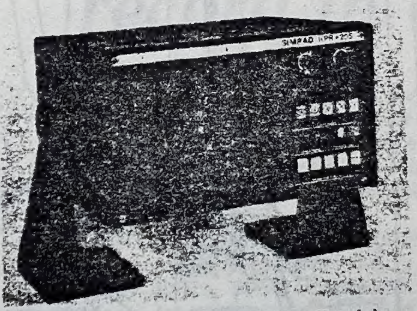
Able to work to 700 meters, the Mantis is a second generation, one atmosphere tethered vehicle, equipped with eight thrusters. The vehicle carries a closed circuit TV system monitored by both the diver operator and the surface personnel, hard wire and emergency wireless communications, and two six function manipulators.

EG&G Sea-Link Systems Underwater Transponder Systems

The ATNAV System is a portable, stand-alone long baseline acoustic navigation system for tracking surface platforms and/or submerged vehicles and equipment. It determines position by measuring the slant range from up to 16 bottom-moored transponders. Transponder array calibration programs as well as ray trace programs to assist in operational placement of transponders are inherent in the ATNAV System.

The SUBATNAV System is intended for use within a manned submersible. It is capable of operating with up to 16 bottom-moored transponders to provide the pilot with his position relative to the transponders and courseline navigation guidance while following a predetermined survey grid.

Simrad Tracking Transducer System



The Hydro Acoustic Position Reference (HPR) is a super short baseline system with long baseline capabilities. The beam-steering function is carried out by an electronic beam-steering technique and a mechanical transducer head training function. In this way, according to the manufacturer, the whole underwater sphere is covered, allowing narrow beam tracking of one or more transponders independent of the transponder's position.

The system is a general underwater navigation system that was designed for long-range tracking purposes. It can be used for precise bottom reference in dynamic positioning, tracking of manned or unmanned submersibles and towed bodies, site survey operations and underwater equipment handling.

Study of the application of inertial navigation to submersibles. Advanced Systems Group, Ferranti Computer Systems Ltd. January 1980. OT-81-2420.

This report discusses the feasibility of using an inertial navigator (IN) for navigation and control of ROVs. It concludes that IN can be applied cost-effectively to about half the tasks currently performed by remotely-operated vehicles. Most tasks are associated with platform work although a small market may exist for high accuracy measurement and survey. Because of the IN's ability to provide instantaneous position and attitude information, it could form the basis of a comprehensive navigation and autopilot system. To maintain high accuracy, frequent updating is required and the study discusses a range of sensor options to provide this updating information, including doppler sonar and auto correlation of TV pictures showing the geometry of the viewed object. It is acknowledged that all sensors carried by an ROV are of potential use to a navigation and control system, and a conceptual design is suggested in which all sensors are input to a Kalman filter, allowing the best statistical update information to be fed to the IN at any time.

Performance testing of underwater manipulators. S J Cocking and D J M Drew, AERE Harwell. October, 1980. OT-81-2428.

Manipulators are used to attempt many tasks under water but, despite their potential, little work has been done to analyse the features which affect their capability or to provide a quantitative measure of their performance. This study examines the feasibility of assessing performance without resorting to lengthy trials requiring expensive support equipment and services.

Study of attachment of vehicles to structures underwater. Sub Sea Surveys Ltd. June 1980. OT-81-2429.

When attempting some underwater tasks, particularly where forces or torques must be reacted, it is preferable for the vehicle to be attached to the worksite in some way. This report describes the methods which have been adopted or proposed and also calculates some of the forces the systems may have to resist when the vehicle is working in a current. The report concludes that little quantitative evidence on system performance is available. Attachment systems have been little used to date, but there will be an increasing future requirement. It is probable that ROV usage has been hampered by lack of a suitable system.

Further information: Mr D W Partridge, OSO, Department of Energy, Alhambra House, 45 Waterloo Street, Glasgow G2 6AS. Tel: 041-221 8777.

Copies of the reports are available from: Technology Reports Centre, Orpington Kent BR5 3RF. Tel: Orpington 32111.

Wet transfer rescue is successful

WHILE WORKING at a water depth of 119 m in a North Sea oil field, a diving bell with two divers on board suddenly lost its support systems.

The situation seemed at first hopeless. The bell's umbilical cord had been severed. What followed was a text-book rescue operation, involving the first deep water "wet" transfer of divers from the disabled bell to a rescue bell.

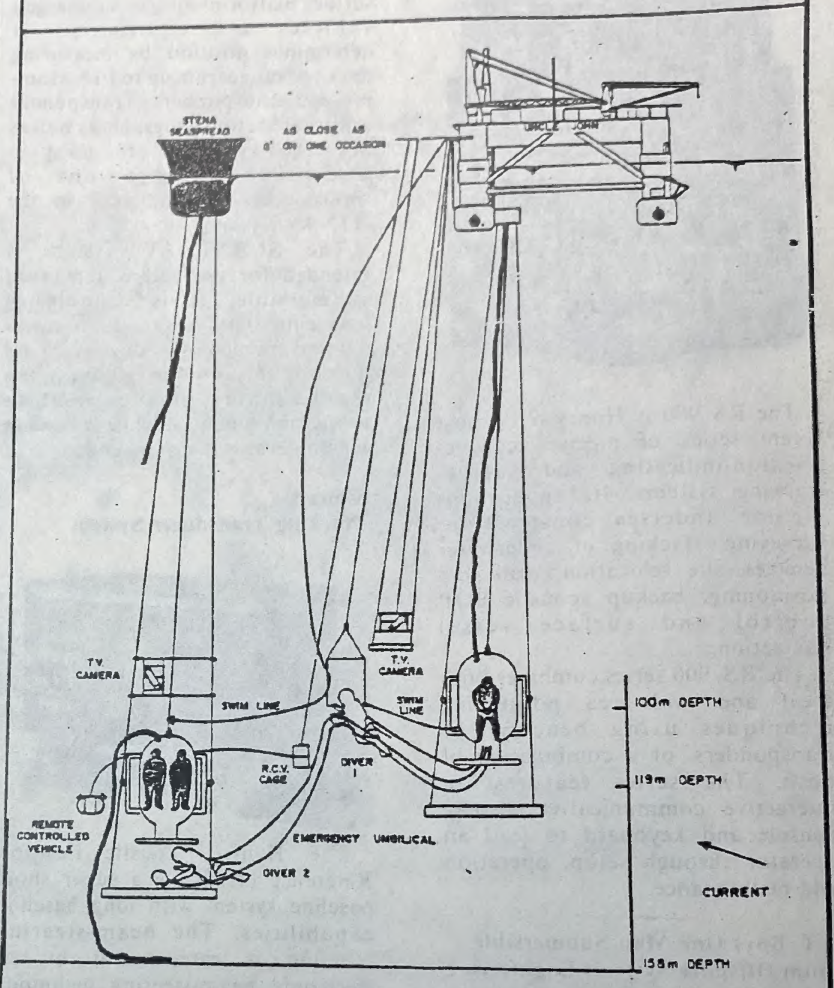
The incident occurred at the end of January, 1981 in Thistle field operated by British National Oil Corp. in the northern portion of the North Sea.

Within minutes after the mishap, the semisubmersible diving support vessel Uncle John, operated by Comex Houlder Diving Ltd. of Aberdeen, received a call from its client — Shell UK Exploration and Production — advising that a diving emergency had occurred on the Thistle Field, some 20 miles distant, and asking that assistance be given.

It was decided that the best hope for the trapped divers lay in the concept of a "wet" transfer — i.e., sending down a rescue bell from the Uncle John and moving the trapped divers to it.

This complex exercise would involve modifying the umbilical arrangements of the rescue divers to allow them to make the long swim between the rescue bell and the stricken bell; establishing through water communications with the trapped divers; and locating the stricken bell and surveying it by means of the Uncle John's television equipped remote control subsea vehicle. For a visual account of the rescue operation, see the accompanying illustration.

Here's how the rescue took place



About 3 hours from the start of the rescue mission, Uncle John was a mile away from the emergency site and began to ballest down to her normal semisubmersible configuration. All during the voyage, the diving personnel on board had been planning exactly how the rescue would be made; equipment had been checked; and all preparations made.

A combination of wind and a 2.2 knot current made the task of getting Uncle John into position no easy matter for barge master, Mike Boland. But a few minutes later the vessel was fully ballasted down and the rescue dive procedures began.

Shortly before 6:00 p.m. the rescue bell began its descent. Aboard were divers Joe Puttnam and Bart Taylor, who would make the rescue attempt. A third Comex Houlder diver, Kenny Iveson, would act as bellman and lend assistance to the rescue divers as necessary.

With the dive underway, Uncle John's remotely controlled subsea vehicle (RCV) was launched and shortly afterwards located the stricken bell and relayed television pictures back to the Uncle John control room. These showed that the disabled bell's umbilical was hanging down towards the seabed, some 39 m below the bell.

Work basket

At this stage a work basket was lowered from Uncle John to a position roughly midway between the rescue bell and the disabled bell. The basket would act as a rendezvous point if necessary to allow a diver to assist the rescued and/or the rescuers in their long (54 m) swim in strong currents between the bells. To assist further, a wire from Uncle John was shackled around the disabled bell's lift wire, passed through the work basket, and back to the surface. This would provide a 'swim' line between the basket and the stricken bell.

With these operations complete, the first of the rescue divers, Joe Puttnam, equipped with a special mask to provide good quality communications, locked out of the Uncle John bell and began to establish a swim line between the bell and the basket. This job proved difficult because of the continuing strong currents.

Shortly afterwards, the RCV — still monitoring the stricken bell — picked up movement at one of the bell portholes; a handwave from one of the trapped divers. The second Comex Houlder rescue diver, Bart Taylor, now also locked out of the rescue bell and began assisting in the establishment of the swim line between the two bells.

"No seal"

At this point, the bottom door on the stricken bell was lowered and a sign hung out by the trapped divers confirmed earlier fears. The message, picked up by the RCVs vigilant camera, read: No Seal. Transfer to Uncle John.

There was now no doubt that the rescue would have to be accomplished by "wet" transfer. But first the condition of the trapped divers had to be checked. They had now been several hours without supplies of hot water to their suits and the chances of hypothermia were growing.

Shortly before 7:30 p.m., with Uncle John having moved forward slightly on her dynamic positioning systems to assist the divers in relation to the current, the first of the rescue divers arrived at the stricken bell. He passed a spare umbilical inside and then went into the bell to check the condition of the trapped men.

With the agreement of three doctors who had flown out to the site from Aberdeen's Institute of Offshore Medicine, the rescue diver then began pouring hot water from both the spare umbilical and his own hot water hose over the suits of the trapped men to warm them up and minimize the possibility of physiological over-reaction to too rapid a temperature change.

At 8:03 p.m. a little over 2 hours from the start of the rescue dive, the first of the trapped men swam over to the rescue bell. The second rescue diver then went back to the stricken bell to assist the other trapped diver. Shortly after 9:00 p.m. he too was safely in the rescue bell. By 9:20 p.m., rescuers and rescued were all safely back inside the Uncle John bell.

From the moment of the call to Uncle John to the safe return of the trapped divers, 9 hours, 37 min. had elapsed. As in any subsea rescue, it was a race against the elements, a race against cold, a race against time. "What the rescue proved, however," says spokesman for Comex, "the correct deployment of equipment, and, above all, the courage and skill of the rescue divers, could make feasible — and ultimately successful — this difficult and hazardous operation." □

---

2 divers rewarded for part in setting record in experiment

Two divers who set a world's record with a simulated dive to 2,250 feet received trophies — small diving helmets, each stuffed with 2,250 dollar bills — in a presentation at the Offshore Technology Conference Tuesday.

The trophies and cash were presented by Oceaneering International Inc. to two company divers, Steve Porter and Len Whitlock, for their participation in the simulated dive as part of the Atlantis program at Duke University. Eric Kramer, a former Navy diver also participated in that record-setting experiment but was not present at Tuesday's press conference in the Astrodome.

The record dive was the third in a series of simulations performed within a pressure chamber at Duke University medical center to determine rates of compression, hydrostatic pressure which produces high pressure nervous syndrome in divers and other effects.

Dr. Peter Bennett, director of F.G. Hall Laboratory at the Duke University Medical Center, said that by breathing a 10 percent nitrogen mixture in helium and oxygen, the divers were able to perform difficult and strenuous exercises during the 24 hours they spent in simulated pressure of 2,250 feet.

The divers broke both depth and duration records during the test, spending 11 days at depths greater than 2,000 feet, 7 days deeper than 2,132 feet and one day at 2,250 feet.

Although the offshore industry really hasn't any call yet for divers to work at depths greater than 1,000 feet, Porter said, "We feel we have a start to go to 2,000 feet" which could eventually have commercial applications.

Because of dexterity and accessability requirements, Whitlock said, "sooner or later divers will have to work on the ocean bottom" in place of present mechanical submarine manipulators.

But Bennett bristled at questions about the value of an experiment which exceeds present needs. "Why is that question always asked of us when NASA can shoot up all sorts of things to go up and look at dead balls in the sky?" he demanded.

Although the oceans cover 70 percent of the globe and will be the source of future resources, he said, billions of dollars are invested in exploration of outer space while his group has trouble finding enough money just to maintain their diving chamber. "We have the advantage now," he said, "but I fear the technology will switch to Europe."

INLAND MOTOR

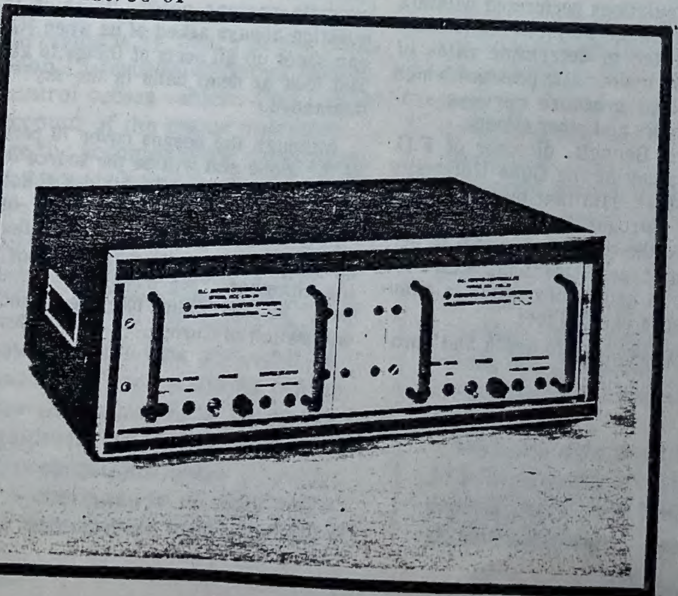
ELECTRONIC CONTROLLERS FOR DC BRUSHLESS PROPULSION MOTORS

Kollmorgen's new switching controller for D.C. brushless propulsion motors employs a six-transistor bridge to supply the electric current to the three-phase motor windings in a sequence regulated by a Hall-effect position sensor located in the motor housing. The controller is remotely operated from a voltage source within the vehicle control panel. The combined transistor controller and rotor position sensor provide smooth torque delivery over a wide operating range incorporating such features as rapid acceleration and motor reversal.

When used with Kollmorgen's new Rare Earth Cobalt brushless propulsion motors for underwater applications, the controller provides a highly efficient system having long life and minimum maintenance requirements.

MODEL		ECC-120/15 -01	ECC-120/30 -01	ECC-120/50 -01	ECC-120/100 -01
Input Voltage Range	volts	90-130	90-130	90-130	90-130
Input Current	amps	15	30	50	100
Output Voltage; 3 Phase Line-to-line Max.	volts	120	120	120	120
Output Current Max.	amps	15	30	50	100
Input Control Signal	volts	±0.6 to ±15	±0.6 to ±15	±0.6 to ±15	±0.6 to ±15
Output Current Control	amps	0-15	0-30	0-50	0-100
Monitor Output Voltages	volts	0-10	0-10	0-10	0-10
Motor Current	amps/volt	3	3	3	3
Motor Speed	rpm/volt	500	500	500	500
Operating Temperature	°C	0-55	0-55	0-55	0-55
Dimensions H × W × D	in	5¼ × 8½ × 11	5¼ × 8½ × 11	8¾ × 19 × 11	8¾ × 19 × 11

ECC-120/30-01



Make the distinction and make your choice with confidence in our long-standing reputation.

Kollmorgen Industrial Drives Division
Research and Development
Radford, Virginia 24141
703 639 3963 TWX 710 875 3740